Compressed Air Magazine

AUGUST 1947

A MINE BOSS ON HIS IRON STEED

A variation of the bicycle that provides fast underground transport in West

VOLUME 52 • NUMBER 8

NEW YORK • LONDON

SURE cure for a drill's "ills" – drill doctors say – is *effective lubrication*. Use Texaco Rock Drill Lubricants (E.P.), and your drills will stay in peak condition longer, require less servicing, cut greater footage at lower cost.

Texaco Rock Drill Lubricants (E.P.) have "extreme pressure" characteristics – give all moving parts full protection against wear. They resist oxidation, always flow readily, prevent rust and corrosion whether drills are running or idle.

Leading rock drill manufacturers approve Texaco Rock Drill Lubricants (E.P.) because they meet the lubrication requirements of every type of drill design and operating condition.

For Texaco Products and Lubrication Engineering Service, call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

PROTECT COMPRESSORS, TOO! Get more efficient, economical compressor operation by lubricating with the recommended *Texaco Alcaid, Algol or Ursa Oil*. All these famous oils prevent hard carbon formations – keep rings free, valves active, ports and air lines clear. Use them to keep pressure up, costs down.

TEXACO

TEXACO Rock Drill Lubricants (E.P.)

Tune in . . . TEXACO STAR THEATRE presents the TONY MARTIN SHOW every Sunday night. See newspaper for time and station.

EXCLUSIVE *DOUBLE ACTION PRINCIPLE* GUARANTEES BOTH CLEAN AND DRY AIR

1. MECHANICAL SEPARATION

Deflector cup directs flow of air or gas together with water, oil and dirt to the walls of the housing and thence downward at high velocity into the base where liquid and heavier dirt particles are deposited.

2. FILTRATION

Air or gas, having been mechanically cleaned, rises at low velocity through the Radial Fin Filtering element or insert which removes the lighter air-borne material.

The popularity of Staynew Double Action Pipe Line Filters increases as manufacturing tolerances decrease—as vanes and pistons are closer fitted, orifices are made smaller, machines in general are built to more precise limits and processes are more scientifically controlled. Inexpensive, quickly installed and easily maintained, these filters provide highest filter efficiency with low overall maintenance.

IMPORTANT APPLICATIONS

Protection of Air-operated Tools ★ Paint Spray ★ Sand Blast ★ Air Displacement of Liquids ★ Air-operated Instrument Controls Liquid Agitation

COMPLETE DATA ON REQUEST

DOLLINGER CORPORATION

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

7 CENTRE PARK ROCHESTER 3, N. Y. IN CANADA: McCarthy and Robinson, Toronto; Engineering Equipment Co., Montreal

MORE THAN 1,000,000 STAYNEW PIPE LINE FILTERS SOLD TO INDUSTRY

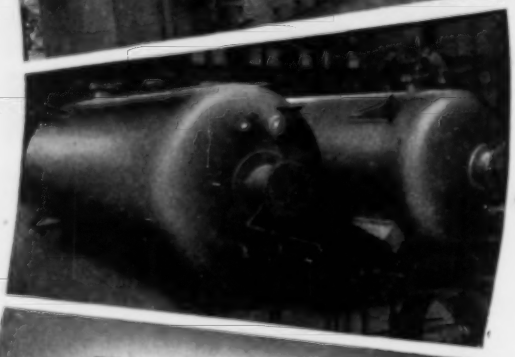
USE THESE BETTER

Vogt Products

For Today's Tough Service Demands

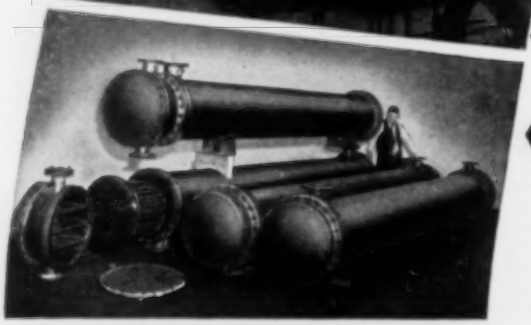
EFFICIENT AND DEPENDABLE STEAM GENERATION

Vogt steam generating units are designed to give maximum rating in a minimum of space with high efficiency and low maintenance expense. Bent tube types and straight tube, forged steel sectional header types to burn solid, liquid or gaseous fuels, as desired, meet every power, heating or process requirement.



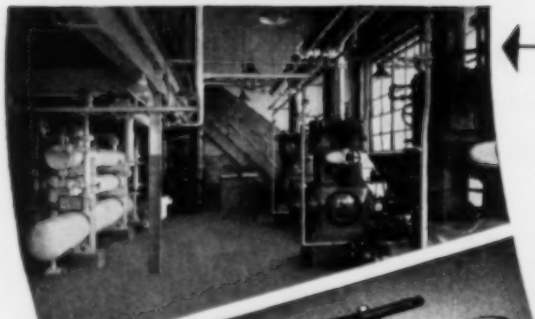
PROCESS EQUIPMENT FOR EVERY SERVICE

Stills, towers, oil chilling machines, filter presses, heat exchangers, etc. are constructed to all Codes. They meet all demands for operating security and trouble-free performance and help to lower costs in important process industries around the world.



SPECIAL MATERIALS FIGHT CORROSION AND PRODUCT CONTAMINATION

Our modern shops produce a wide variety of equipment made from special metals and alloys to combat corrosion, and product contamination or discoloration. Fabrication procedures employed insure that corrosion resistant properties of welds will match that of the materials from which units are constructed.

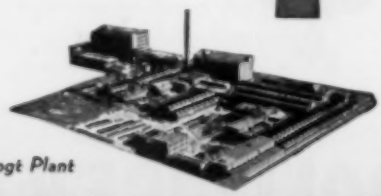


MORE TONNAGE AT LESS COST

Over 60 years of manufacturing experience, engineering and research stand behind Vogt refrigerating and ice making machinery. Absorption Systems, Compression Systems, and the Automatic Tube-Ice Machine in a wide range of capacities serve in leading petroleum refineries, chemical plants, ice and cold storage plants, dairies, packing plants, etc., at home and abroad.

DROP FORGED FOR EXTRA TOUGHNESS AND LONG-TIME SERVICE

Vogt valves, fittings and flanges, for top performance in oil, water, air, gas, and ammonia services, at high or low pressures and temperatures, are available drop forged entirely from carbon steel or stainless steel. Valves can be furnished in a combination of materials by using stainless steel for parts affected by service temperature or corrosion, and less expensive alloys or carbon steel for other parts.



Air View of Vogt Plant

HENRY VOGT MACHINE CO.

LOUISVILLE 10, KENTUCKY

BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS

AMAZING NEW

Electric IMPACT Tool

- Applies and removes nuts
- Drills
- Reams
- Taps
- Drives and removes screws
- Drives and removes studs
- Extracts broken cap screws and studs
- Runs wire brushes
- Does hole saw work
- Drills brick and masonry
- Drives wood augers

Uses standard attachments

*

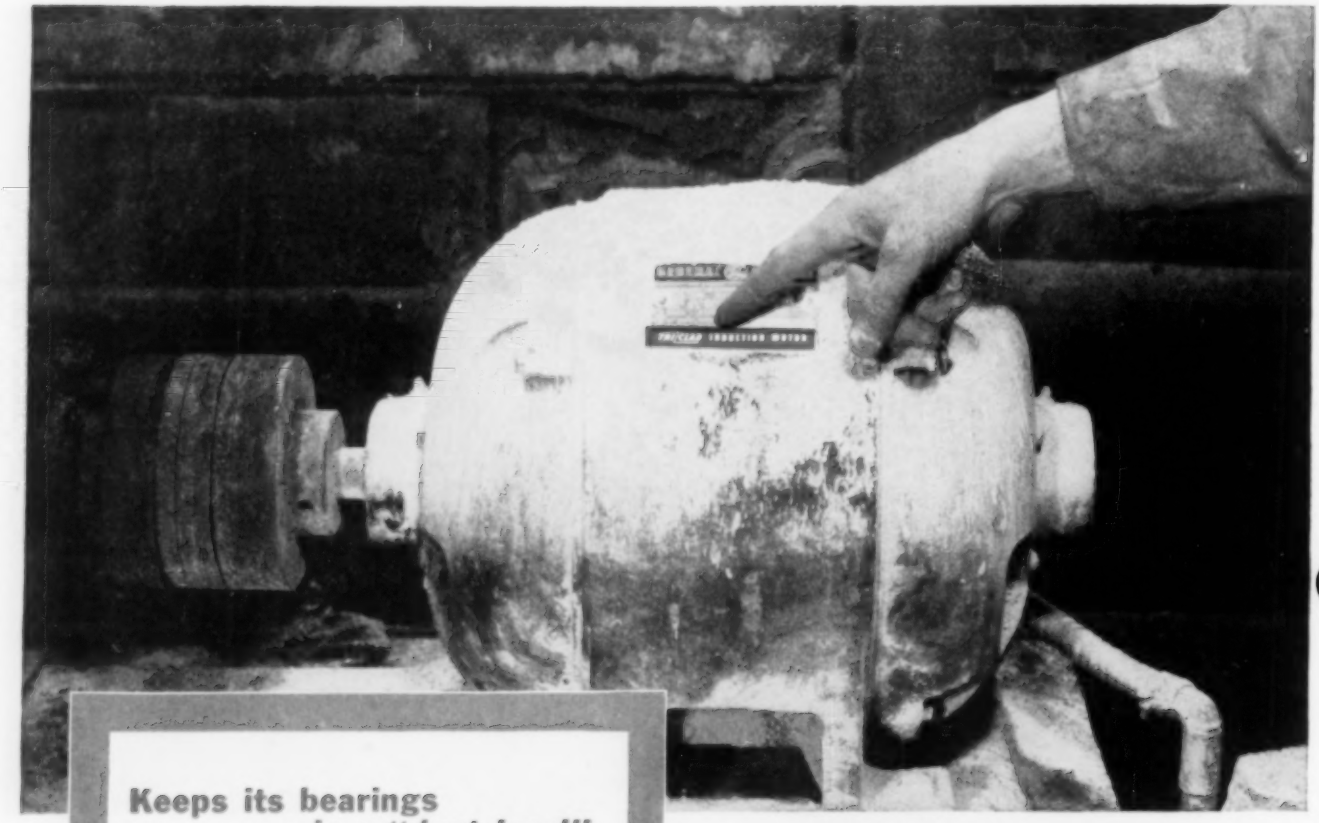
Powered with special, reversible universal electric motor... plug into any wall socket... no torque reaction to the operator... takes the drudgery out of a multitude of maintenance and production jobs*... see our nearest branch office or distributor.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

1-8

ON 1,220,000



Keeps its bearings *in a "dust bowl"*

Ordinarily, we wouldn't recommend that you use an open motor on a job like this. This Tri-Clad motor drives a boiler-feed pump in the National Gypsum Company plant at Clarence Center, N. Y. The air surrounding the motor is constantly filled with gypsum dust which must be kept out of the bearings. And it *has* been kept out of the bearings of this Tri-Clad motor, thanks to its specially designed bearing housing and seals. We believe that the Tri-Clad motor you see here proves that even where dust, moisture, or some other hazard is extremely severe for open-motor applications, the extra protection afforded by Tri-Clad motor construction results in longer motor life and lower upkeep.

and now—THE TOUGHEST TRI-CLAD YET

Newest addition to the Tri-Clad motor family is the Tri-Clad totally enclosed, fan-cooled motor. It is designed for use in adverse atmospheres—in iron dust, out-of-doors, in hazardous areas, and chemical atmospheres. Available in both standard and explosion-proof types, this Tri-Clad motor gives you these important construction features:

- A cast-iron, double-wall frame which completely encloses and protects the windings and punchings.
- A nonshrinking compound around motor leads which protects motor interior from dust and moisture.
- A rotating labyrinth seal which further protects the motor interior from damage by foreign matter.

MOTORS

TRI CLAD

THE SYMBOL OF

EXTRA PROTECTION

Announcement of the Tri-Clad motor, back in 1940, ushered in a new concept of general-purpose motor design. Substantially increased horsepower-per-frame-size, was one feature. Smarter appearance was another. But what really sold more than a million Tri-Clad motors is the *extra protection* we built into them.

Often operating under conditions no general-purpose motor should be asked to meet, Tri-Clad motors built up an enviable record of war-time service. Today, with the "family" including dripproof motors, vertical motors, gear-motors, capacitor-motors, and totally enclosed motors, the Tri-Clad motor is, more than ever, the motor that means basic protection, dependable performance, and minimum upkeep. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

EXTRA PROTECTION...AGAINST PHYSICAL DAMAGE!

Rigid cast-iron frame and end shields protect vital motor parts from external abuse and prevent resonance. Because they're not at the mercy of a coat of paint, they strongly resist chemical attack and dampness. Cast iron also gives you tight, *metal-to-metal* fits between end shields and frame.

EXTRA PROTECTION...AGAINST ELECTRICAL BREAKDOWN!

Motor windings of Formex* wire, together with improved insulating materials, reduce the chances of electrical failure. Heat is dissipated quickly — motor stays young for years and years!

EXTRA PROTECTION...AGAINST OPERATING WEAR AND TEAR!

Bearing design affords longer life, greater capacity, improved lubrication features. Bearing seals retain lubricant, keep out dirt. One-piece, cast-aluminum rotor is practically indestructible.

*Trade-mark reg. U. S. Pat. Off.

GENERAL ELECTRIC

750—285

TRI CLAD

REG. U.S. PAT. OFF.

MOTORS

- OPEN (DRIPPROOF)
- TOTALLY ENCLOSED
- EXPLOSION-PROOF

"Flex-Disc"

CLUTCHES for MACHINE TOOLS

Thoroughly proved by eight years of very severe service in I-R Mobil-Air Compressors, Flex-Disc Clutches are now being applied to machine tools. Their advantages are briefly:

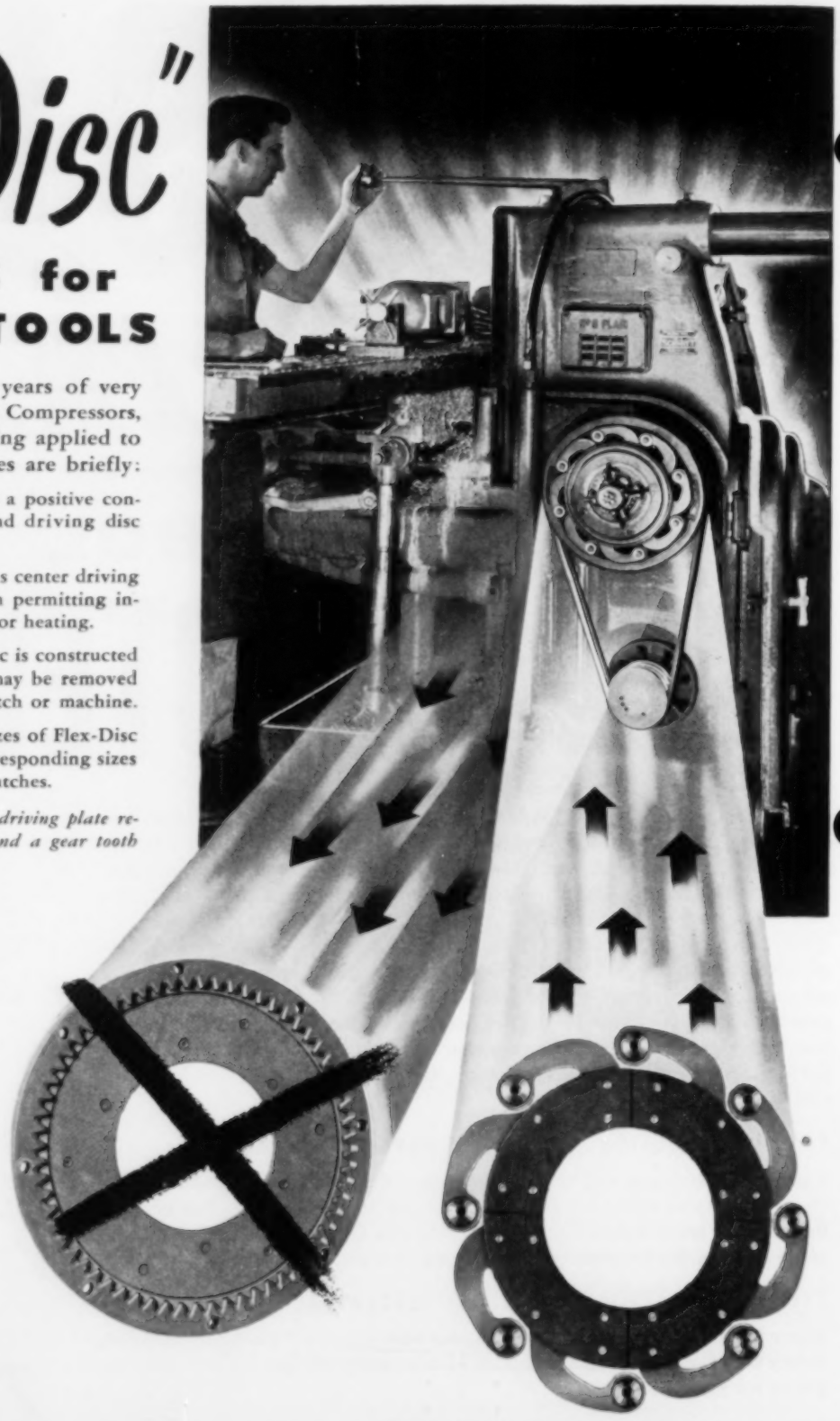
1. No back-lash or chatter. There is a positive connection between driving member and driving disc through resilient integral links.

2. Positive release. The resilient links center driving disc between driven plates of clutch permitting indefinite operation without dragging or heating.

3. Easy Maintenance. The driving disc is constructed with interlocking segments which may be removed for relining without dismantling clutch or machine.

4. Interchangeability. The several sizes of Flex-Disc Clutches may be put in place of corresponding sizes of conventional gear tooth driven clutches.

Our illustration shows a "Flex-Disc" driving plate replacing an internal gear drive ring and a gear tooth driving disc on a milling machine.



CUSTOM-MADE CLUTCHES

To meet special operating conditions. We will cooperate with you in solving any special clutch problems whether your order is for a few or for thousands.

INDUSTRIAL CLUTCH CORPORATION

Waukesha Wisconsin

What's the Limit?

The Empire State Building, soaring almost a quarter mile into the New York skyline, is the tallest building in the world. Can man build higher? One famous architect says, "Yes—twice as high!" What's the limit?

IS *Porous Chrome* THE ENGINE-LIFE PISTON RING?

We don't know *yet*, but the records of millions of rings now in service indicate that possibility.

KOPPERS POROUS CHROME* piston ring sets, tested in all types of gasoline and diesel engines, rolled up amazing records: ring life was multiplied four or five times—wear on the block was cut in half—all because of the gentle lapping action by the ring surface porous enough to hold lubricants during its seating-in period.

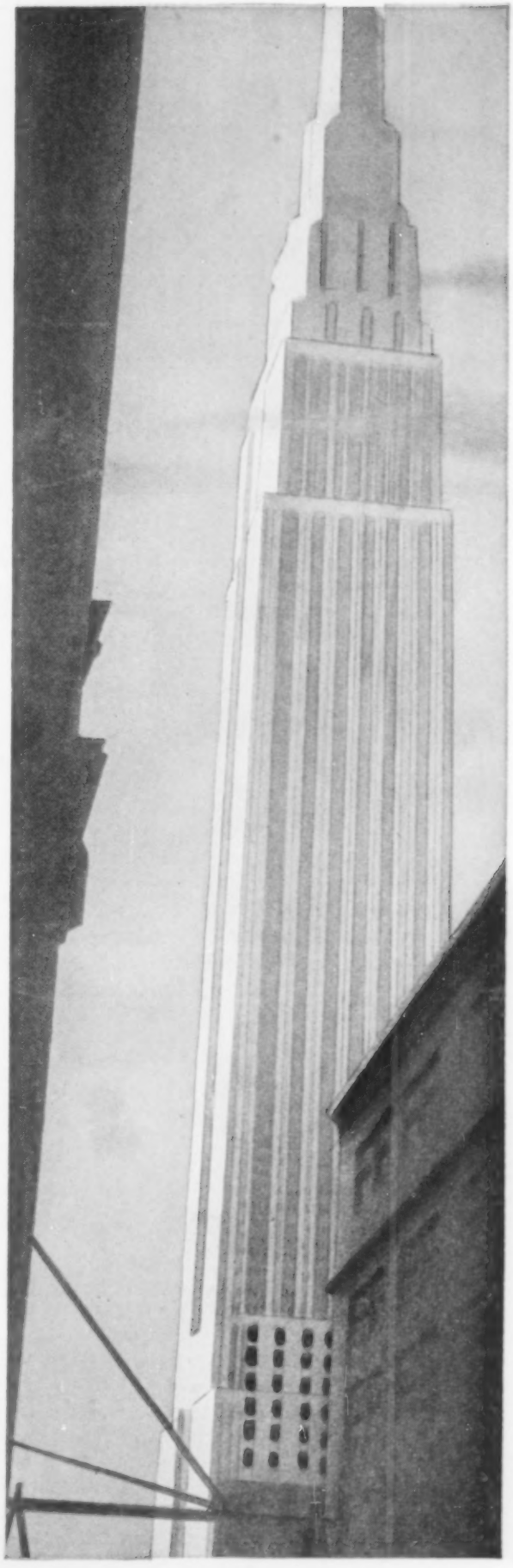
These amazing piston rings are produced for all types of gasoline and diesel engines. Specify them on new equipment. Use them on overhauls. For more specific details on your motor, address Koppers Company, Inc., Piston Ring Division, Box 626, Baltimore 3, Maryland.

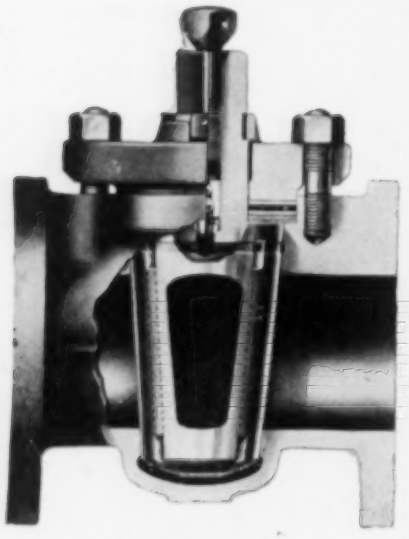
*VAN DER HORST PROCESS

K KOPPERS

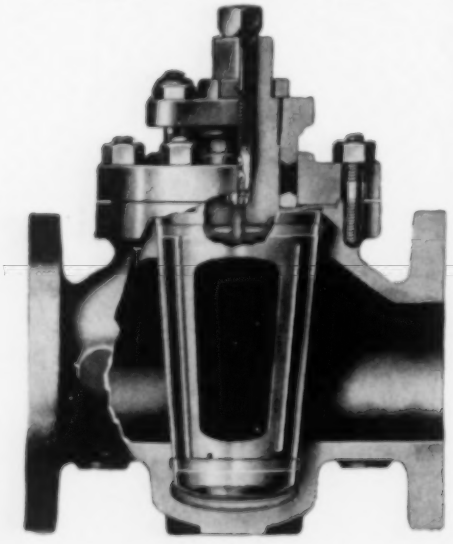
American Hammered Piston Rings

IN EVERY SIZE—OF EVERY TYPE—
FOR EVERY SERVICE

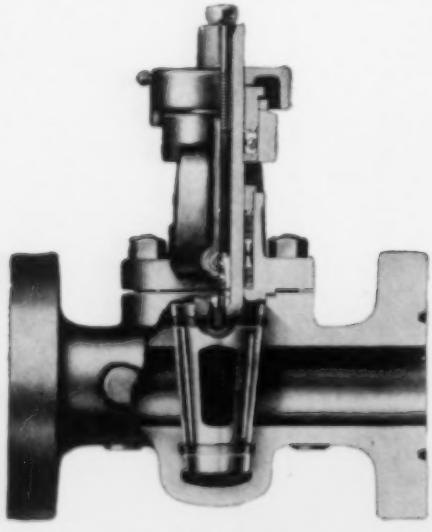




Single Gland Type



Regular Gland Type



Ball Bearing Type

FOR HANDLING

Acids... Solvents... Sludges...

and other troublesome liquids—

USE WALWORTH LUBRICATED PLUG VALVES

When handling acids, condensates, dyes, oils, solvents, solutions, slurries and hundreds of similar "troublesome" liquids, you get better control, more dependable service and lower operating costs with Walworth Lubricated Plug Valves.

These valves have proved their ability to give easy operation . . . fast action . . . tight shut off . . . greater protection against corrosion. Turning is smooth and easy; just a ¼ turn from full-opening to full-closing. Moreover, Walworth Lubricated Plug Valves are tightly sealed against leaks — *whether open or shut.*

Walworth Lubricated Plug Valves are available in sizes ½" to 24" for pressures from 125 to 5,000 psi, and for vacuum requirement. For further information about Walworth's Complete Line of Lubricated Plug Valves, see your Walworth distributor or write for Catalog No. 46L.

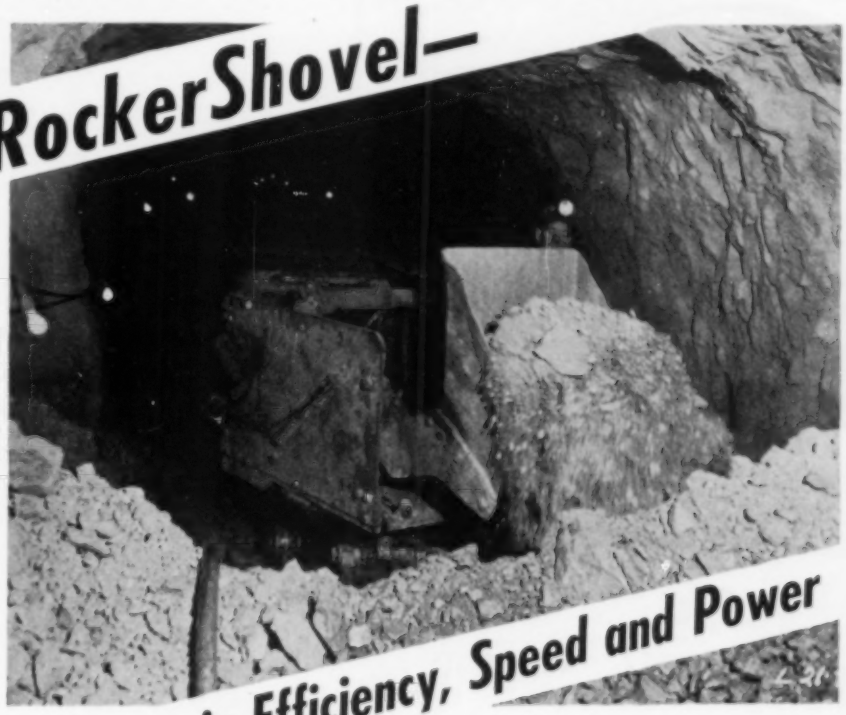
WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

RockerShovel—



First in Efficiency, Speed and Power

Yes, the RockerShovel is first choice with mining men and contractors because of its many superior features. There is a RockerShovel to fit your needs and each Model is efficient . . . loads the ore or waste into the cars without spillage, with less maintenance cost per ton loaded than any other loader on the market. The speed and power of the RockerShovels can not only be traced to their heavy duty, 5 cyclinder motors, but to the powerful leverage designed into the machines, which provides 2 to 3 times greater mechanical advantage on the RockerShovel than any other type machine.

Investigate the superior qualities af the RockerShovel. Insure your operation for greater profits and safety to your employees!

Write for further information.

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturer of Underground Rock Loading Machines

Executive Offices and Factories — Salt Lake City 8, Utah:
Branches — 67 Wall St., New York 5 — 3319 So. Wallace, St., Chicago 16 — Mills Bldg., El Paso — 1217 - 7th St., Sacramento 14

Only the RockerShovel carries its weight at the fulcrum point.

Cheaper with RockerShovels than chutes and grizzlies.

Underground — it's Eimco.

Eimco RockerShovels have won EVERY competitive test in every mining district in the world. Don't take our word for it — investigate.

Why not buy a champion loader.

Wise contractors choose Eimco.

RockerShovel — the safe loader.

Load on slopes to 45%

Only Eimco makes a full line of RockerShovels, each with a full range of discharge heights, buckets and track gauges.

Ask the man who loads the can.

GUARANTEE

The inherent superiority of Eimco loaders has been so thoroughly proved that every machine sold now carries a positive money-back guarantee that it will outlast and out-perform any other mucking machine of comparable size and type at any air pressure, and under any working condition.

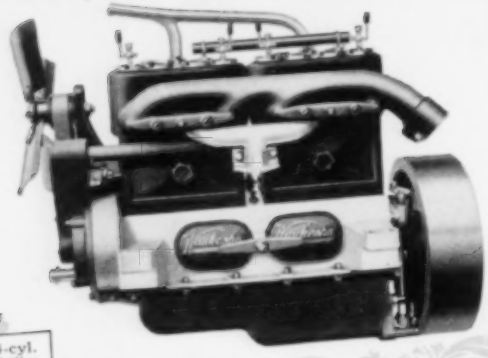
Established world's speed record of 1879' in 31 days through the aid of Eimco RockerShovels.

1288 cu. ft. loaded in 50 mins.

A-144

Waukesha

TRADE MARK REG.



Model L, 4-cyl. 35 H.P., 4¼" x 6¼", 382 cu. in.

THE OUTSTANDING MOTOR *of 1917*

The Waukesha Motor Company is not building pleasure car motors, but is devoting all its energies and resources to the development of the right type of motor for heavy duty service.

Fattening a race horse to give it added weight will never make it suitable for draft horse work, neither will adding weight to a pleasure car motor make it suitable for heavy duty truck or industrial work.

Therefore we have not been handicapped by any inclination to err in the matter of principle but have built solidly, right from the beginning, upon the firm foundation of *correct design*.

The Elements of Design that Have Made the Waukesha Motor Famous

1. Large bearings where needed.
2. Correct distribution of bearing surfaces.
3. Bearing material that excels in strength and wearing quality.
4. Connecting Rod Bearings that do not wear out.
5. Chrome Nickel Steel Crankshafts that stand the wear of bearings.
6. Torque and Power Curves especially adapted to heavy service and ability at speeds that are most used.
7. Speeds of maximum torque and H.P. within the governed speed.
8. Waukesha patented governor that does not fall apart and is lubricated by the oiling system of the motor.

Designed and Built By
WAUKESHA MOTOR CO.
WAUKESHA, WISCONSIN.

an ad with "tell-all" copy **SOLD** this engine **30 YEARS AGO!**

● World Wars . . . I and II . . . have come and gone—but this Waukesha Engine of 1917 goes on . . . and on . . .

But let's hear what Mr. John M. Weed, Superintendent of McAlester Fuel Co., Rockdale, Texas, has to tell us:

"We are pleased that you are able to give immediate shipment of our parts order for "Old Faithful" Waukesha Motor No. 24656 Model L originally sold in 1917, and which we have used since 1919 or 1920.

"The engine is in its original hook-up, that is, it is still driving an Ingersoll-Rand Compressor and, believe me it has made plenty of wind in its lifetime.

"Four years ago while hauling this compressor into our mine pit, the coupling broke and the compressor unit rolled backward, took a sheer drop of fourteen feet, and turned upside down. We turned it over, filled the crankcases, and the gas tank, cranked it up, and much to our surprise and happiness she went back to work making wind.

"The writer has been in this line of work since the age of 16, and in those 40 years or more he has learned that the word *Waukesha* on an internal combustion engine really means something."

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN

NEW YORK • TULSA • LOS ANGELES

IF YOU WANT YOUR ROCK DRILL OIL TO:

...have high film strength to withstand shock loads—

Get Houghton's **STA-PUT!**

...eliminate "fogging" and toxic gases—

Get Houghton's **STA-PUT!**

...not "blow" readily, nor interfere with valve action—

Get Houghton's **STA-PUT!**

...lubricate perfectly at any speed and temperature—

Get Houghton's **STA-PUT!**

...be non-corrosive; wet out all parts rapidly—

Get Houghton's **STA-PUT!**

...not form gummy residues; be high in oiliness—

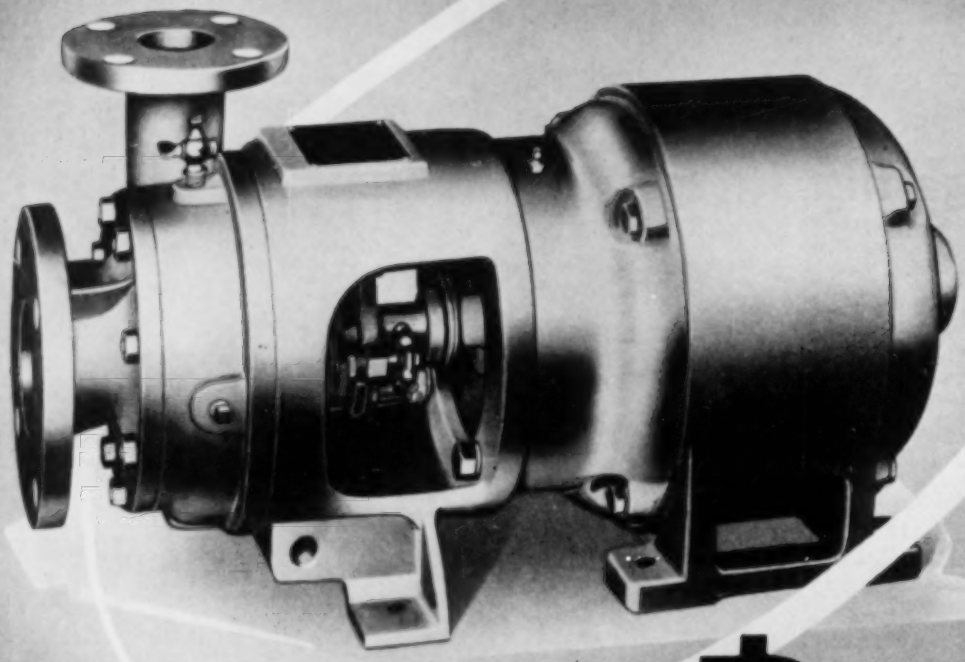
Get Houghton's **STA-PUT!**

Mining men, excavating contractors, quarrymen—every one who uses air-operated tools praises Sta-Put Lubricants for the above reasons. They're made from finest petroleum stock, reinforced by chemical treatment. And they're available without delay, from E. F. HOUGHTON & CO., Philadelphia, or Chicago, Detroit, Cleveland, San Francisco and Charlotte.

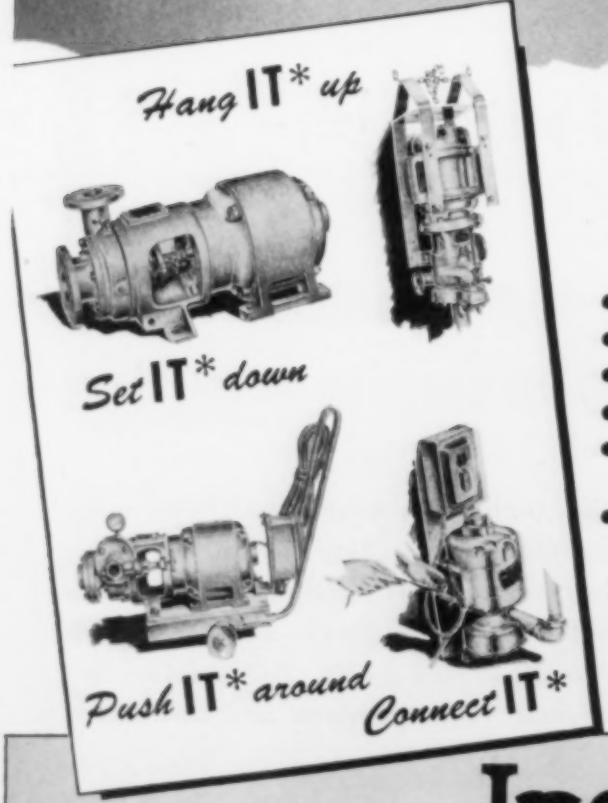
REMEMBER! WITH HOUGHTON'S STA-PUT, YOU USE

Less oil... Less often...

THE *Versatile* PUMP...



MOTORPUMP*



HERE IS WHY THE MOTORPUMP HAS THE STAMINA FOR CONTINUOUS SERVICE ON COUNTLESS, VARIED JOBS:

- Motor and pump on one rigid, extra-heavy shaft.
- Oversize bearings insure long life.
- Simplicity—only one moving part—the rotor.
- Works in any position.
- 75 years of pump-building experience are built into the Motorpump.
- Heads to 600 ft. Capacities to 1800 gpm.

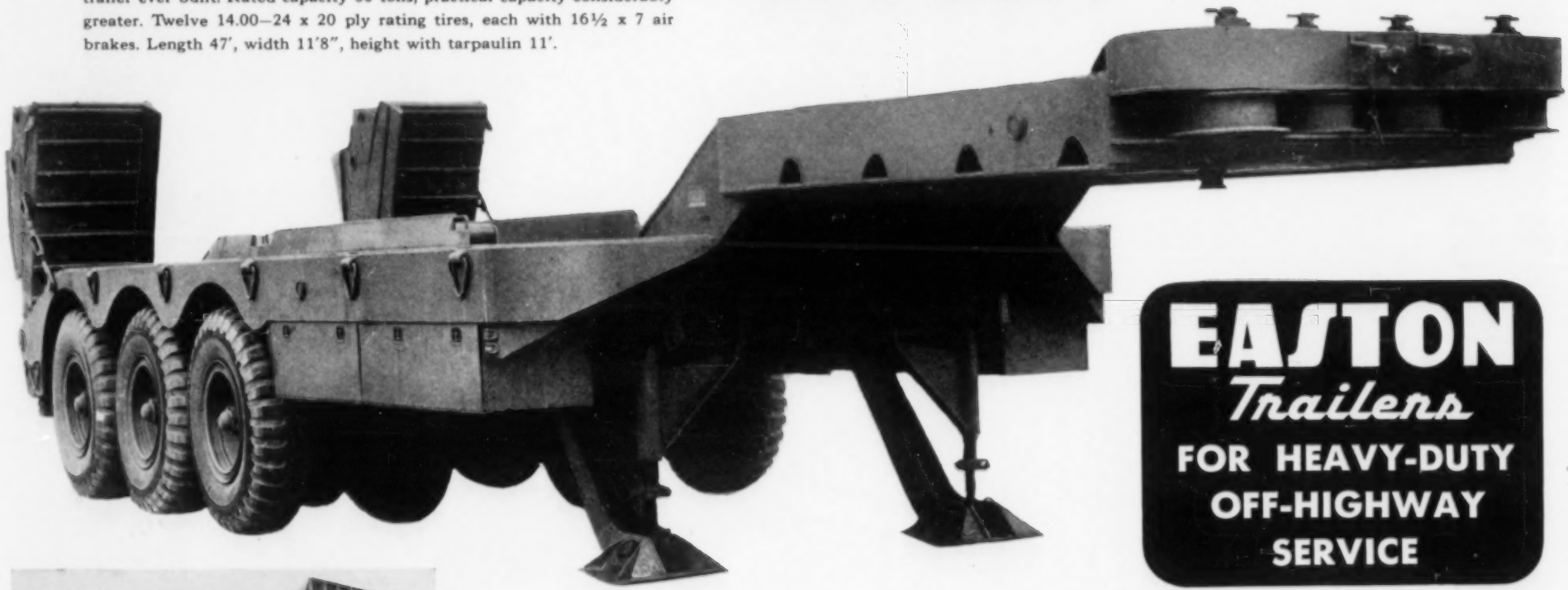
Send for the Motorpump Catalog. There's an I-R Engineer near you who will be glad to help you with your pumping problems.
Offices and Agents throughout the World.

8-9

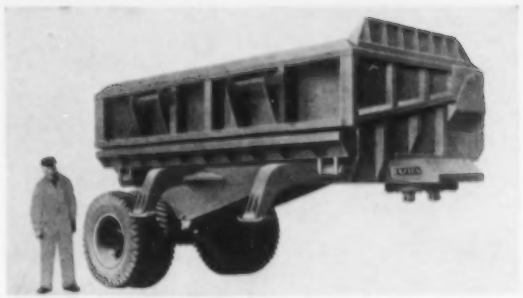
11 BROADWAY, NEW YORK 4, N. Y. **Ingersoll-Rand**

THE LOADS ARE GETTING *BIGGER* ALL THE TIME

Easton Model T-63 Army Cargo Semi-Trailer, said to be the largest semi-trailer ever built. Rated capacity 60 tons, practical capacity considerably greater. Twelve 14.00—24 x 20 ply rating tires, each with 16½ x 7 air brakes. Length 47', width 11'8", height with tarpaulin 11'.



EASTON
Trailers
FOR HEAVY-DUTY OFF-HIGHWAY SERVICE



Typical of Easton Trailers in heavy-duty mine and quarry haulage is the rugged Model TL, which features a bale-lift door. Capacity up to 40 tons.

Easton's T-63 will carry heavy army vehicles. Converted with stake sides and tarpaulin cover, it will haul cargo payloads of considerably more than the rated capacity of sixty tons over rough terrain. A smooth ride for amazing loads was made possible by adaptation of a new type wheel suspension developed by Easton Engineers for heavy-duty mine service.

In mines and quarries and other industrial fields, big Easton trailers have replaced car and truck haulage operations by providing greater efficiency and flexibility in the movement of heavy loads.

Big trailers afford a new mobility to heavy industrial installations which were formerly limited to stationary operation.

* Plant operating executives will envision the opportunities to put bigger off-highway trailers to work. Easton will design and build these trailers.

Easton Car & Construction Company • Easton, Pa.

A-1911

ALL TYPES OF HEAVY-DUTY INDUSTRIAL CARS • TRAILERS • TRUCK BODIES • ELECTRIC TRUCKS

SMOOTH AND CONTINUOUS OPERATION HINGES ON THE *Lubrication System*

MADISON-KIPP ___ is the most dependable lubrication system ever developed. It is applied as original equipment on America's *finest* machine tools, work engines, and compressors . . . You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

MADISON-KIPP CORPORATION

202 WAUBESA STREET, MADISON 4, WISCONSIN, U. S. A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marias, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

One of a Kind

Powerful *Texrope* drive specially engineered for a large mill. This main driver sheave is 7 ft in diameter, has 30 grooves, transmits 1400 hp!

...or One of A THOUSAND!

EVERY TEXROPE DRIVE IS ENGINEERED FOR ITS JOB

YOU GET sound recommendations from Allis-Chalmers — recommendations backed by the greatest V-belt engineering talent and experience in the business.

Allis-Chalmers originated the Multiple V-belt drive 22 years ago. Since then, *Texrope* engineers have designed many thousands of drives, ranging from fractional horsepower units for manufacturers of small compressors, pumps or washing machines—to the largest V-belt drives ever installed. They've served: Textile, Mining, Metal working, Petroleum, Chemical . . . in fact, *every* major industry.

Take advantage of this vast research and experience. Bring your V-belt problems to headquarters — for the best in engineering talent — for the most complete line of V-belt equipment made.

Service is as close as your nearest Allis-Chalmers dealer or office. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2239

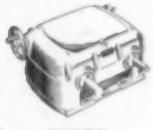
Refer to Sweet's Catalog

TEXROPE .. Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationary or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

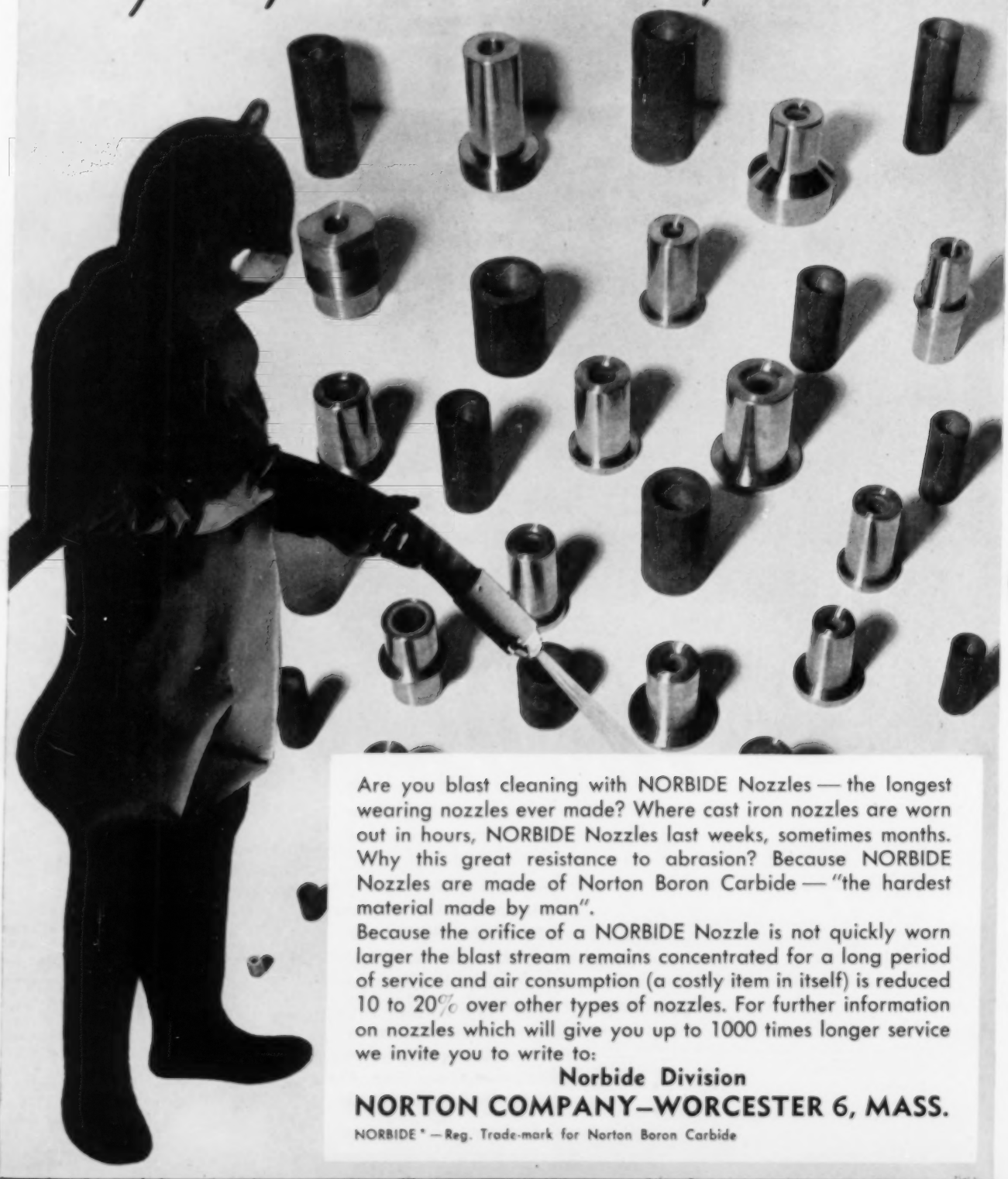
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

NORBIDE* NOZZLES

Give up to 1000 Times Longer Service



Are you blast cleaning with NORBIDE Nozzles — the longest wearing nozzles ever made? Where cast iron nozzles are worn out in hours, NORBIDE Nozzles last weeks, sometimes months. Why this great resistance to abrasion? Because NORBIDE Nozzles are made of Norton Boron Carbide — "the hardest material made by man".

Because the orifice of a NORBIDE Nozzle is not quickly worn larger the blast stream remains concentrated for a long period of service and air consumption (a costly item in itself) is reduced 10 to 20% over other types of nozzles. For further information on nozzles which will give you up to 1000 times longer service we invite you to write to:

Norbide Division

NORTON COMPANY—WORCESTER 6, MASS.

NORBIDE * — Reg. Trade-mark for Norton Boron Carbide

*** Hardest Material Made by Man**

Compressed Air Magazine

COPYRIGHT 1947 BY COMPRESSED AIR MAGAZINE COMPANY

VOLUME 52 **August, 1947** NUMBER 8

G. W. MORRISON, *Publisher*

C. H. VIVIAN, *Editor* — J. W. YOUNG, *Director of Advertising*
ANNA M. HOFFMANN, *Associate Editor* — J. J. KATARBA, *Advertising Mgr.*
A. W. LOOMIS, *Assistant Editor* — DON J. MAREK, *Advertising Sales*
D. Y. MARSHALL, *Europe*, 243 Upper Thames St., London, E.C., 4.
F. A. MCLEAN, *Canada*, New Birks Building, Montreal, Quebec.

EDITORIAL CONTENTS

A "Mine" in Seventy-Second Street—*C. H. Vivian* 186
Colorado Highway Follows Gold-Rush Rail Route—*L. A. Luther* 191
More Water for St. Catharines, Canada—*W. G. McLaughlin* 196
Industry Can Have Beauty 200
Handling Concrete Blocks in Yard by Air Hoist 202
Dust-Free Packaging of Powdered Products 203
Oranges Wrapped in Pliofilm by Aid of Vacuum 203
This and That 204
Editorials—Rock-Drilling Costs—Saturday's Accidents 205
Hot-Cold Tube Phenomenon Explained 206
Improved Iron-Ore Concentrator 206
Industrial Notes 207

ADVERTISING INDEX

Allis-Chalmers Co. 17
American Air Filter Co., Inc. 28
American Brass Company, The 22
Bethlehem Steel Co. 23
Burke Electric Co. 25
Compressed Air Magazine 33
Conrader Co., R. 33
Cook Mfg. Co., C. Lee 27
Crane Co. 24
Crucible Steel Company ..... 3rd Cover
Dollinger Corp. 3
Easton Car & Construction Co. 15
Eimco Corp., The 11
France Packing Company 30
Garlock Packing Co., The 34
General Electric Co. 6, 7
Goodall Rubber Co., Inc. 34
Goodrich, B.F. 20
Houghton & Co., E.F. 13
Hose Accessories Co. 33
Industrial Clutch Corp. 8
Ingersoll-Rand Co. 5, 14, 26, 35
Johnson Corp., The 34
Koppers Co., Inc. 9
Madison-Kipp Corp. 16
Maxim Silencer Co., The 32
New Jersey Meter Co. 31
Niagara Blower Co. 30
Nicholson & Co. 32
Norgren Co., C.A. 31
Norton Co. 18
Powell Co., The Wm. 29
Square D Co. 31
Texas Co., The ..... 2nd. Cover
Timken Roller Bearing Co., The ..... 4th Cover
Victaulic Co. of America 19
Vogt Machine Co., Inc., Henry 4
Walworth Co. 10
War Assets Administration 21
Waukesha Motor Co. 12
Westinghouse Air Brake Co. 32

A monthly publication devoted to the many fields of endeavor in which compressed air serves useful purposes. Founded in 1896.

CCA Member Controlled Circulation Audit

Published by Compressed Air Magazine Co., G. W. MORRISON, *President*; C. H. VIVIAN, *Vice-President*; J. W. YOUNG, *Secretary-Treasurer*.
Business, editorial, and publication offices, Phillipsburg, N. J.
Advertising Office, 11 Broadway, New York 4, N. Y., L. H. GEYER, *Representative*.
Annual subscription: U.S., $3.00; foreign, $3.50. Single copies, 35 cents.
COMPRESSED AIR MAGAZINE is on file in many libraries and is indexed in Industrial Arts Index.

ON THE COVER

IN SOME of our western metal mines men pedal along the haulage tracks on vehicles such as the one shown on the cover. These bicycles are popular where working places are at considerable distances from shafts or adit portals. They are not in general use by miners, but many foremen who have to visit various sections of a mine regularly find them timesavers. Repairmen also often ride them when answering hurry-up calls. The machines are of all-metal construction but light, even having wire spokes in their flanged wheels. Consequently, if a rider meets a train he can dismount and quickly lift his vehicle off the track. Our picture was taken in the New Park Mine at Keetley, Utah. The cyclist is N. Craig, the mine superintendent.

•

IN THIS ISSUE

AS OUR leading article points out, hard-rock mining is not confined to metal-producing districts. A lot of it goes on in our big cities, especially in New York, where millions of tons of rock have been removed in driving tunnels for transportation systems and various utilities. Gotham's contractors have become expert in carrying on their burrowing operations with the least interruption in the normal routine of the city's scurrying residents and workers.

•

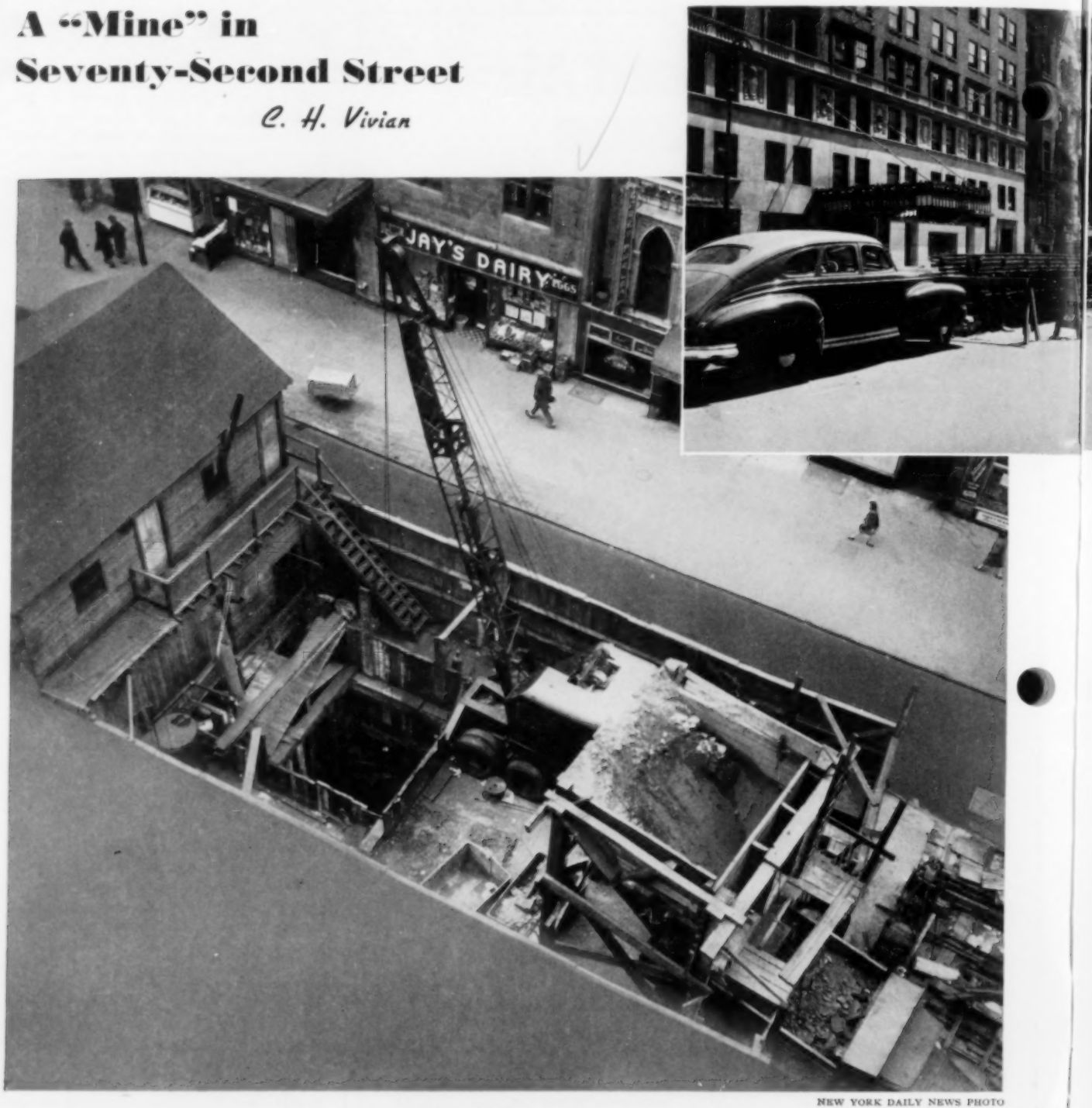
WHEN gold was discovered in the mountains west of Denver in 1859 there were only Indian trails to follow. Crude roads that ox or horse teams could negotiate at a crawling pace were carved out with much labor. Everyone dreamed of the day when rail transportation would be available, and finally a winding, narrow-gauge line was built in Clear Creek Canyon. The people of Central City and Idaho Springs rejoiced and visualized the growth of their "diggings" into large cities. But the fates decreed otherwise. Several decades of intensive mining depleted the store of mineral treasure, and the population began to dwindle. At the same time the railroad had to compete with automotive haulage, and it steadily lost ground. Eventually the rusting rails were torn up, and now the cycle is being completed by converting the old right of way into a modern highway. See page 191.

•

BLESSED with a favorable climate for agriculture and a strategic location for industry, St. Catharines, Ont., Canada, is both a busy and a beautiful community. Like other growing cities it has periodically required more water. Work now being completed involves changes in a 34-year-old tunnel and the laying in it of two 24-inch pipes. See page 196.

A "Mine" in Seventy-Second Street

C. H. Vivian



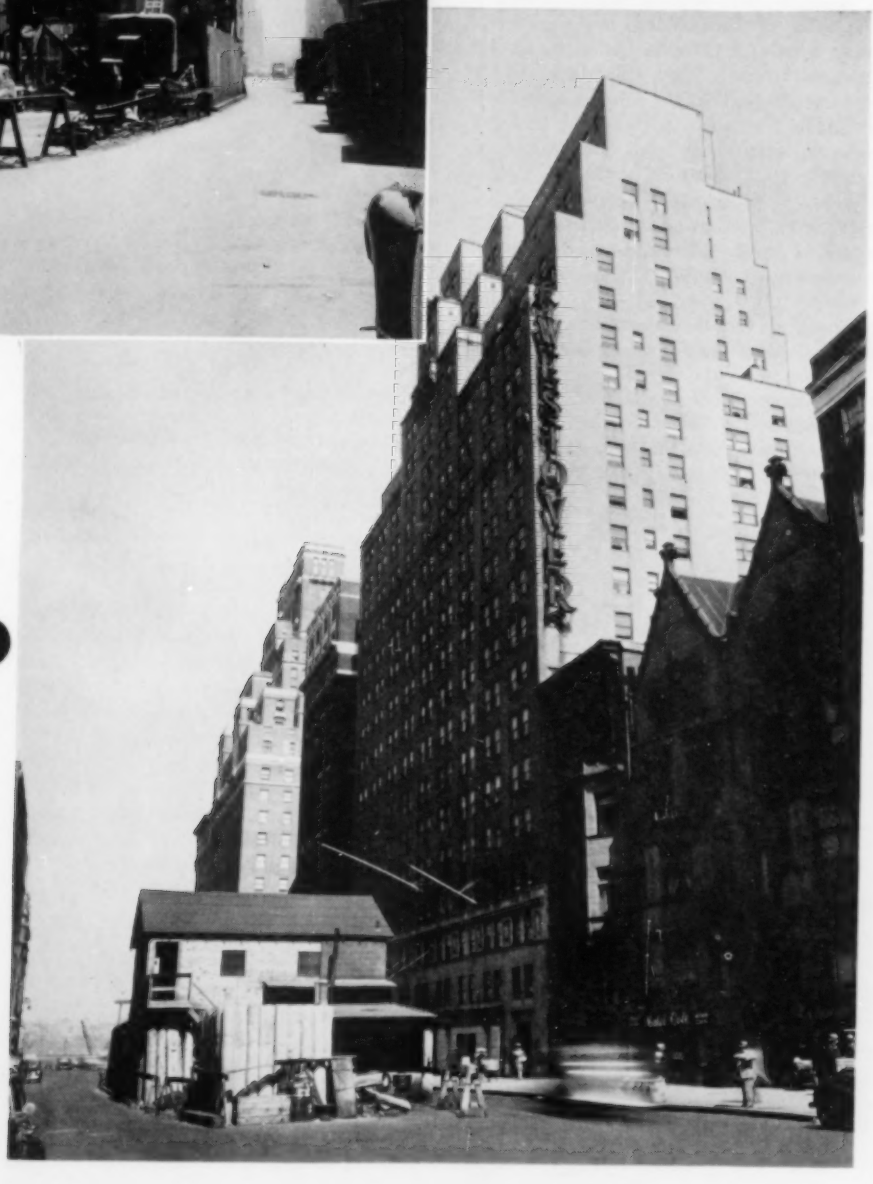
NEW YORK DAILY NEWS PHOTO

BIRD'S-EYE VIEW

The shaft head photographed from a window in a flanking building. Hoisting lines from the crane boom extend down the shaft. At the lower right a truck is being loaded with muck from the elevated hopper.

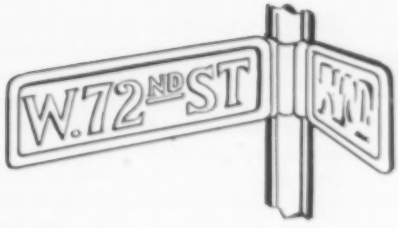
STRICTLY speaking, a mine is a pit or excavation in the earth from which ores, coal, or other wanted minerals are taken. The reason for digging is to extract something that is of value or useful. A looser definition, that has Webster's sanction, calls a mine merely "a subterranean cavity or passage." Also, the verb "mine" is defined by the same authority as meaning "to form a burrow or lodge below the surface." Under these interpretations all tunneling jobs may be classed as mining operations, and they are popularly considered to be in that category.

It is entirely proper, therefore, to apply the term "mining" to the many subsurface burrowing activities that are carried on throughout the world, even though the object is not to recover mineral but, rather, to remove dirt or rock so that the space it has been occupying may be put to some practical use. In short, it is the hole that is wanted and not what comes out of it. With these conceptions of the word, we can call many of our large communities mining camps. Among them, New York City is outstanding because of the extensive underground work that goes on there.



LOOKING EAST AND WEST

Views in opposite directions along West Seventy-Second Street, showing the contractor's plant and equipment occupying the center of the thoroughfare and still leaving room on both sides for the passage of vehicles. The 20-story Westover Hotel forms the background in the picture below. Beyond it are large apartment houses.



Its subsurface is honeycombed with openings for railway, vehicular, or foot traffic, or to carry water, steam, electricity, or gas. Even mail and telegrams are whisked through tubes beneath the streets by streams of compressed air. At points there are as many as four levels of subsurface railroad tracks, and some zones are so congested with tunnels, tubes, and conduits that a mole would have difficulty in getting around.

Any miner from one of our western camps who might be touring New York for the first time would be impressed by the mining activity that is continually underway there. He would feel much at home because he lives a lot among rocks, and a large part of the nation's metropolis rests upon stone foundations. The Borough of Manhattan, the hub about which the business of the city revolves, has so little surficial soil that it is just as well it was built up, for it would never have made a farming community. Much the same can be said for its neighboring borough, The Bronx. Of the three other subdivisions, Richmond (Staten Island) has rock at or close to the surface in many sections, whereas Brooklyn and Queens have mantles of glacial drift.

Wherever feasible, passageways are located far enough underground to permit tunneling through rock. That is the preferred method in Manhattan, because street traffic is so heavy that surface openings seriously retards its flow. Moreover, under these conditions it is little or no more costly to burrow underground than it would be to make shallow open cuts, for progress in the case of the latter is materially slowed up as a result of the congestion under which the work must be conducted. Another advantage of a fairly deep, rock-encased tunnel is that, once completed, it is secure for a long time and hardly anything has to be spent on it for maintenance.

The equipment and procedure employed in the unseen operations vary little or not at all from those found in metal-mining districts, and our visiting miner could go "down the hole" and almost imagine himself still on his own job. He would notice one important difference: the character of the rock. The latter is so distinctive that it is classified geologically as Manhattan Schist. Of igneous origin, it was altered subsequently by pressure and movement to give it typical schistose foliation or banding, with its sometimes flattened black-and-white mineral particles arranged in more or less parallel rows. This gives it a tendency to split or cleave along definite planes, like sedimentary rock deposited on the ocean floor in successive layers.

The schist commonly exists with the foliations dipping angularly from the horizontal, and, as a consequence, neither a vertical nor a horizontal opening will follow them. Instead, the drill holes extend across the grain so to speak. This results in irregular, angular breakage of the rock when blasted, and shaft and tunnel walls therefore exhibit jagged lines. When drilled, the schist reveals peculiarities all its own. Some years ago a Jackhamer was developed especially to meet the requirements of this rock, which it did well. However, the machine failed to show the same efficiency in other parts of the nation where structural conditions were different. Such are the vagaries of rock formations that plague the drill designer.

Above ground there is ordinarily considerable difference between the surface plants of city construction jobs and those of simon-pure mining ventures.

Space being at a premium in New York, equipment is compressed into the smallest possible area, especially if the nature of the work or the lack of other locations necessitates setting it up on the street. The dumps that inevitably accumulate near mine shafts are, of course, absent in a city, for there the muck must be hauled away as fast as it is brought up from below. In New York it is often trucked to municipally owned disposal sites, and much valuable land has thus been reclaimed from surrounding waters. Oftentimes, however, contractors are faced with the need and expense of loading the spoil onto scows and dumping it at sea, or of transporting it to areas outside the city limits and remote from the job.

Occasionally, a New York construction job closely parallels in methods and equipment a mining operation in the hinterland. Such a one is the sewer-excavation contract now nearing completion on Manhattan by William Casey & Sons. It is not a large or costly project, measured by New York standards, because it extends for a distance of only 1500 feet and the bid price was $276,000. The work is being done for the Borough of Manhattan and is part of a network of storm and sanitary sewers planned to relieve existing older and smaller facilities. Originally scheduled to start in 1930, construction was postponed first by the depression and again by the war.

This section of the sewerage system runs westward under and in the middle of West Seventy-Second Street from the east side of Amsterdam Avenue to a point west of Riverside Drive, near the Hudson River. The stretch of West Seventy-Second Street concerned, which is only a few minutes' walk or one express subway stop from the theatrical district that centers around Times Square, is primarily a residential district, with numerous apartment buildings and small- to moderate-size hotels interspersed with retail stores of various kinds.

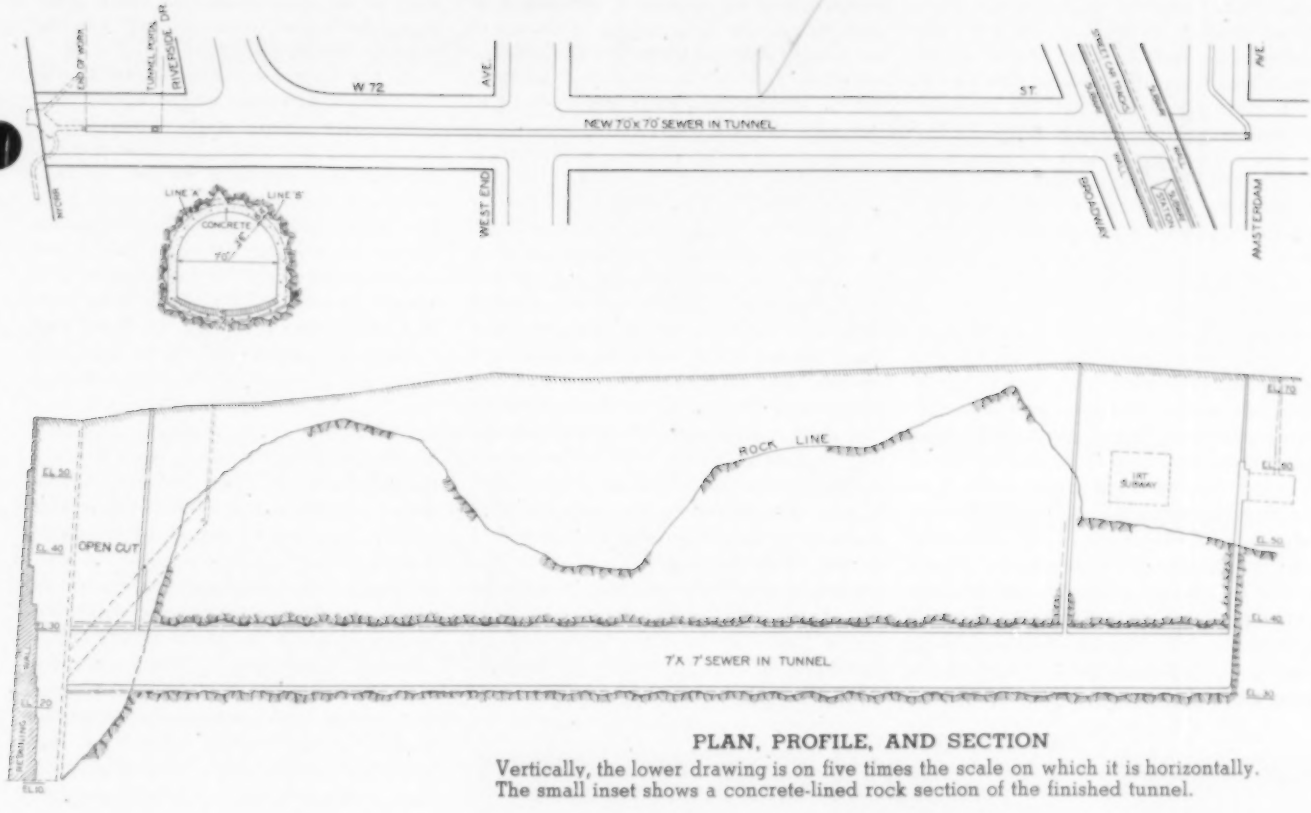
Although it is not one of the heaviest-traveled thoroughfares, it carries considerable vehicular traffic, and opening up the surface throughout the quarter-mile section involved would obviously have imposed difficulties and inconveniences. This would have been true especially at the eastern end, where, as can be seen on an accompanying plan drawing, Broadway and Amsterdam Avenue converge at a slight angle. Both streets carry car tracks, and underneath Broadway is a 4-track subway line. There is a station at the Broadway-Amsterdam intersection, and many thousands of persons enter and leave it daily.

In view of these circumstances, it is apparent that many advantages were to be gained by locating the sewer far enough below the surface to permit carrying it in a rock tunnel. That was done, except for about 100 feet at the western end where the rock falls away almost vertically. This marks the eastern edge of the Hudson River gorge that was carved by glacial action in a bygone age. Elsewhere, the top of the tunnel has a rock cover ranging from 6-7 feet up to 30, with the average around 20 feet. The one shallow stretch is in the vicinity of West End Avenue, where a decided depression in the rock marks the bed of a stream that flowed there until that part of the island was settled. At the eastern end of the contract, where the workers were likely to encounter the greatest complications, the sewer line passes approximately 12 feet under the bottom of the subway, which, in turn, is 20 feet below street level.

The contractor was able to conduct all his tunneling operations through one street opening—through a shaft sunk vertically about midway of the line. This was the only evidence above ground of the activities that were being carried on underfoot. A fence, running parallel with the street, was put up on each side of the shaft collar and extended a few yards eastward and westward from the opening. Within that restricted area

OPEN-CUT WORK

Two views at the western end of the contract, where 100 feet of trench was excavated to a depth of 40 feet. The buildings shown in the picture above face Riverside Drive. The streak of light back of the crane was made by a passing bus.



PLAN, PROFILE, AND SECTION

Vertically, the lower drawing is on five times the scale on which it is horizontally. The small inset shows a concrete-lined rock section of the finished tunnel.

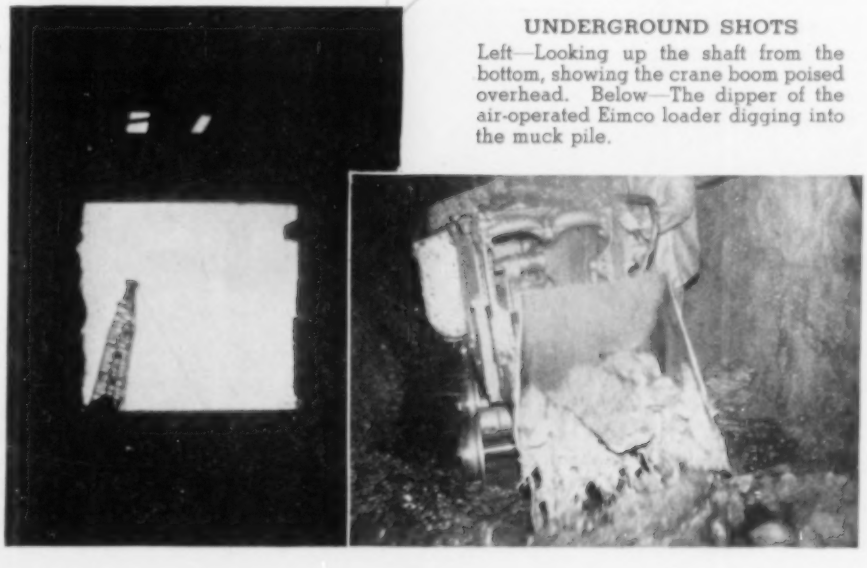
was located the entire surface plant.

Just east of the shaft was erected a 2-story frame structure the lower part of which served as a change room for the workmen and the upper floor as offices for the contractor and the city engineering staff assigned to the job. On the east wall of this building was a lean-to beneath which were housed the two Ingersoll-Rand 315-cfm., portable compressors that furnished the required air power. West of the shaft was constructed an elevated timber muck bin, and adjacent to it was a clear space large enough for the truck-mounted Osgood crane that hoisted the excavated material out of the shaft and dumped it into the bin under which trucks could be driven for gravity loading. Miscellaneous equipment and supplies were stored inside the fence lines or in the middle of the street to the westward. With all the plant thus centrally disposed there was ample room on both sides of it for the passage of vehicles, so traffic was not impeded noticeably and the general life of the community went on much as before.

At the shaft site rock lies 12 feet below the pavement, and down to that point the opening was of 11x14-foot section. For the remainder of its total 40-foot depth it was 9x12 feet. Headings were driven both east and west from the bottom of the shaft and were approximately 9x9 feet in section. A small drill carriage, with two DA-30 drifters on a column bar, did the drilling alternately at the two faces, being mounted on car wheels to facilitate moving it on the 30-inch-gauge tracks that were laid as the work progressed. An average of 30 holes made up a round, and the average advance per round was 5.2 feet. Drill rods of 2-, 4-, and 6-foot lengths were used successively and were fitted with Jackbits that were reconditioned in a custom shop operated by B. Consolazio & Son at Mount Vernon, N. Y.

Holes were loaded with DuPont 40-percent dynamite and fired electrically. Muck was handled by an Eimco 12-B Shoveloader dumping into 2-yard tray-like "battleship" buckets carried on flat cars. An average round broke around 21 cubic yards of rock, measured in the loose, or enough to fill eleven cars. As the tunnel has a slight downgrade from east to west, cars from the east heading rolled to the shaft by gravity, one at a time, and each empty was pushed back by the men. Cars were pulled up the grade from the west heading by a cable and air-operated Ingersoll-Rand D6U hoist stationed at the shaft bottom.

As the work advanced, a switch was provided about 400 feet west of the shaft. When a full car being hauled upgrade reached that point, a sling was attached to an empty standing on the siding and the latter was pulled on to the



UNDERGROUND SHOTS

Left—Looking up the shaft from the bottom, showing the crane boom poised overhead. Below—The dipper of the air-operated Eimco loader digging into the muck pile.

main track, where it could be run down to the heading by gravity. When a car reached the shaft bottom, chains on the crane line were attached to shackles at both ends of the bucket for hoisting. Dumping into the elevated bin was done by the aid of lines attached to shackles on the sides. Trucks owned by Raymond R. Schultze were loaded direct from the bin and hauled the muck to a disposal area.

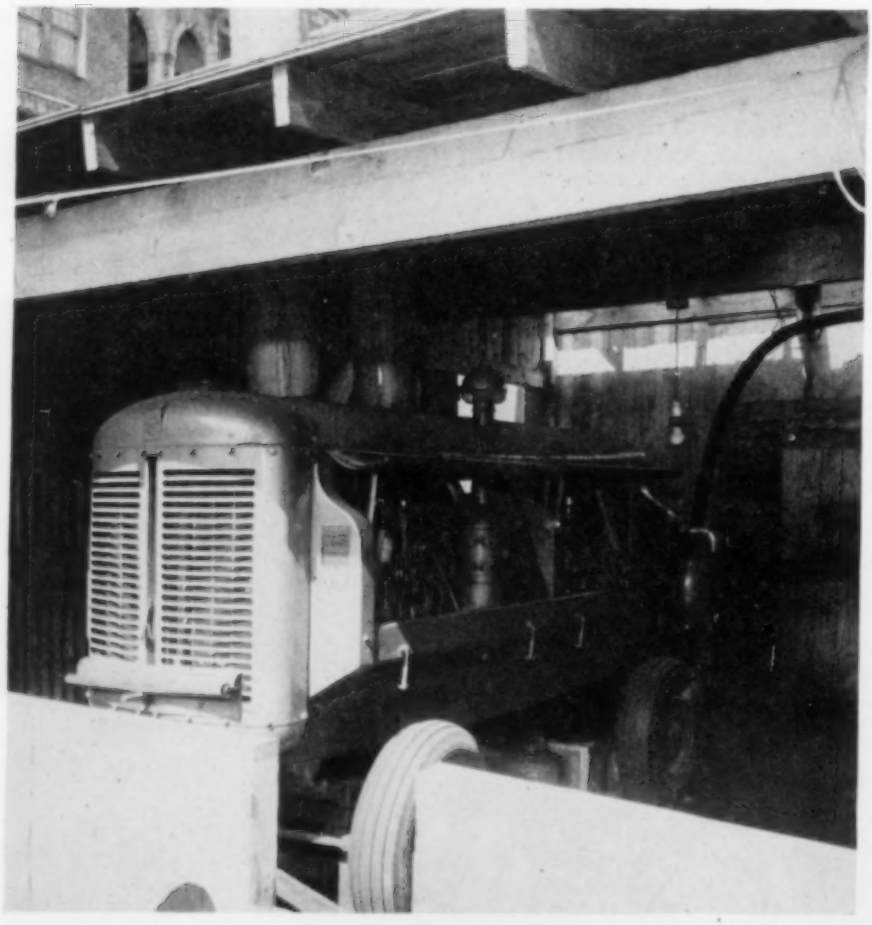
Except for the stretch of about 12 feet where the tunnel passes under the old stream course, the rock stood without requiring support. There, too, where the rock cover was of minimum thickness, the influx of water was heaviest. Some water was encountered throughout most of the tunnel, a contributing factor perhaps having been bore holes that the city engineers had put in at 100-foot intervals to determine rock conditions prior to awarding the contract. Water flowed by gravity from the east heading to the shaft, where it was pumped to the surface by an Ingersoll-Rand Motorpump. An I-R sump pump handled the water that accumulated at the west heading and transferred it through a 2-inch pipe to the Motorpump at the shaft bottom. Fresh air from the surface was supplied the workers by an electric-driven blower that delivered 4630 cfm. through 12-inch sheet-metal pipe lines extending to within a few yards of both headings.

The tunnel was lined with concrete to give it a finished horseshoe-shaped cross section of 7x7 feet. A minimum of 8 inches of concrete was applied to the walls and roof. The invert was covered with a 2-inch course of vitrified liner plate backed up by concrete averaging 6 inches thick. Ready-mixed concrete was discharged from trucks into a hopper at the shaft collar and run down through an "elephant trunk" to a secondary hopper at the shaft bottom. From there it was transferred to the hoppers of a Pumpcrete machine, which delivered it to the forms through piping. A 48-foot section of side walls and roof was placed at a time, using metal-sheathed timber forms made up by the contractor and mounted on cars for ready portability. The stretch east of the shaft was the first to be concreted, and with that done the forms were moved to the western section.

At the extreme western end of the contract, where there was no rock cover, the concrete sewer was constructed at the bottom of an open cut that was excavated to a depth of 40 feet by conventional methods. The cut was 12½ feet wide and was protected against caving by driving timber sheeting and cross-bracing it. The sewer was connected to two 7x7-foot lines that were laid some years ago when the New York Central depressed its tracks that run along the Hudson River shore at that point. The connection was made at a manhole that had previously received the discharge of old sewer lines beneath the sidewalks of West Seventy-Second Street. At the eastern end of the section served they are 12 inches in diameter. Farther west, as the number of connections from buildings increases, the pipes are 15 inches in size, and still farther on the lines consist of 2x3½-foot concrete structures. These facilities have been inadequate for some years, and during heavy storms the water has backed up into cellars. The shaft that provided access to the new tunnel has been finished to serve as a large manhole and will be used during the cold season of the year to dispose of snow cleared from the street.

The Casey forces began work last September. Drilling was started in October and was completed in April. From 35 to 40 men were employed in two shifts between 6 o'clock in the morning and eleven at night. About the only time the residents and tradespeople were aware of what was going on below the street was when shots were detonated. Blasting is always a contractor's headache in a thickly populated district such as this one, for in New York many persons work at night and sleep in the daytime. Inevitably, then, some complaints about disturbed slumbers are received regardless of the hour chosen for shooting. However, by spacing holes closely and loading each one lightly, as was done in this case, it is possible to keep noise down to a minimum, as well as to lessen concussion and thereby guard against damaging adjacent structures. New York contractors have become expert in handling explosives under the conditions imposed on them by their environment.

The work described has been directed by William Casey and his two sons, William H. and John J., assisted by Francis P. Walters. The contract was let by the Department of Borough Works of the Borough of Manhattan, of which Hugo E. Rogers is president. Plans were prepared under the direction of Michael Klein, chief engineer. The Borough's resident engineer on the job was Max Berliner, whose chief inspector in the field was Joseph McManus.

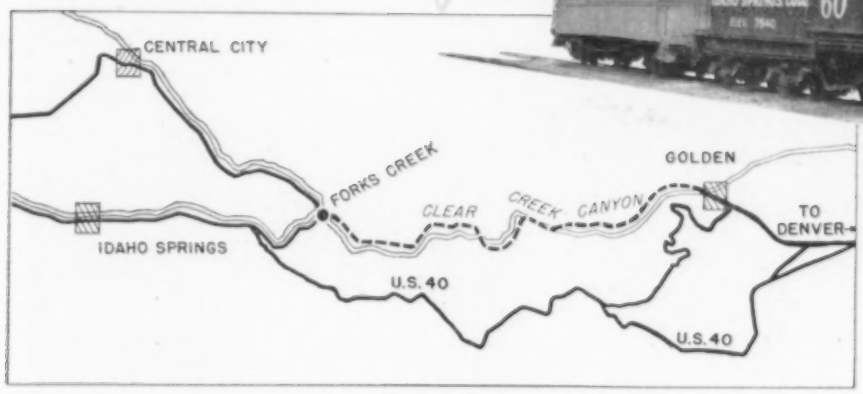


SOURCE OF AIR

A 315-cfm. Mobilair compressor under a lean-to adjoining the contractor's building. Two of these units were stationed at this point while tunneling operations were in progress. Later on, when concrete was being placed underground, one machine was moved to the western end of the contract to furnish air for drilling boulders in the open-cut excavation.

Colorado Highway Follows Gold-Rush Rail Route

L. A. Luther



ROUTE OF NEW ROAD

The dotted line indicates the Clear Creek Canyon section now being completed after a wartime suspension of work. Highway U.S. 40, which winds through the mountains, is the existing auto route and is a link in one of the through roads across the Continental Divide and westward. The part of the new highway between Forks Creek and U.S. 40 is already in service.

AMONG prewar projects being resumed in Colorado is the relocation of a section of U. S. Highway 40, one of the principal east-west routes running through Denver. The present road ascends the foothills of the main Rocky Mountain Range just west of Golden and pursues a winding, up-and-down course until it descends into the valley of Clear Creek a few miles east of Idaho Springs. The new, more direct route will follow the water grade of Clear Creek Canyon from Golden to the junction just mentioned. Its westerly end, extending from Forks Creek to the junction, was built several years ago. The remaining stretch, which is now underway, is 11.3 miles long.

For the most part, the line of relocation is that of a narrow-gauge railroad which occupied the canyon until recent years. This right of way is being widened throughout. It involves heavy rock cuts, and in six places the engineers decided that it would be more economical to tunnel through the spurs of rock. Three of these bores are in the section already completed. Two others, one 700 feet long and the other 1100, have been driven but not finished. At present, the Larson Construction Company is building 1.09 miles of the highway at the eastern end of the project under a $350,000 contract. It includes an 860-foot tunnel that has been sublet to the John R. Austin Construction Company and with which this article largely deals.

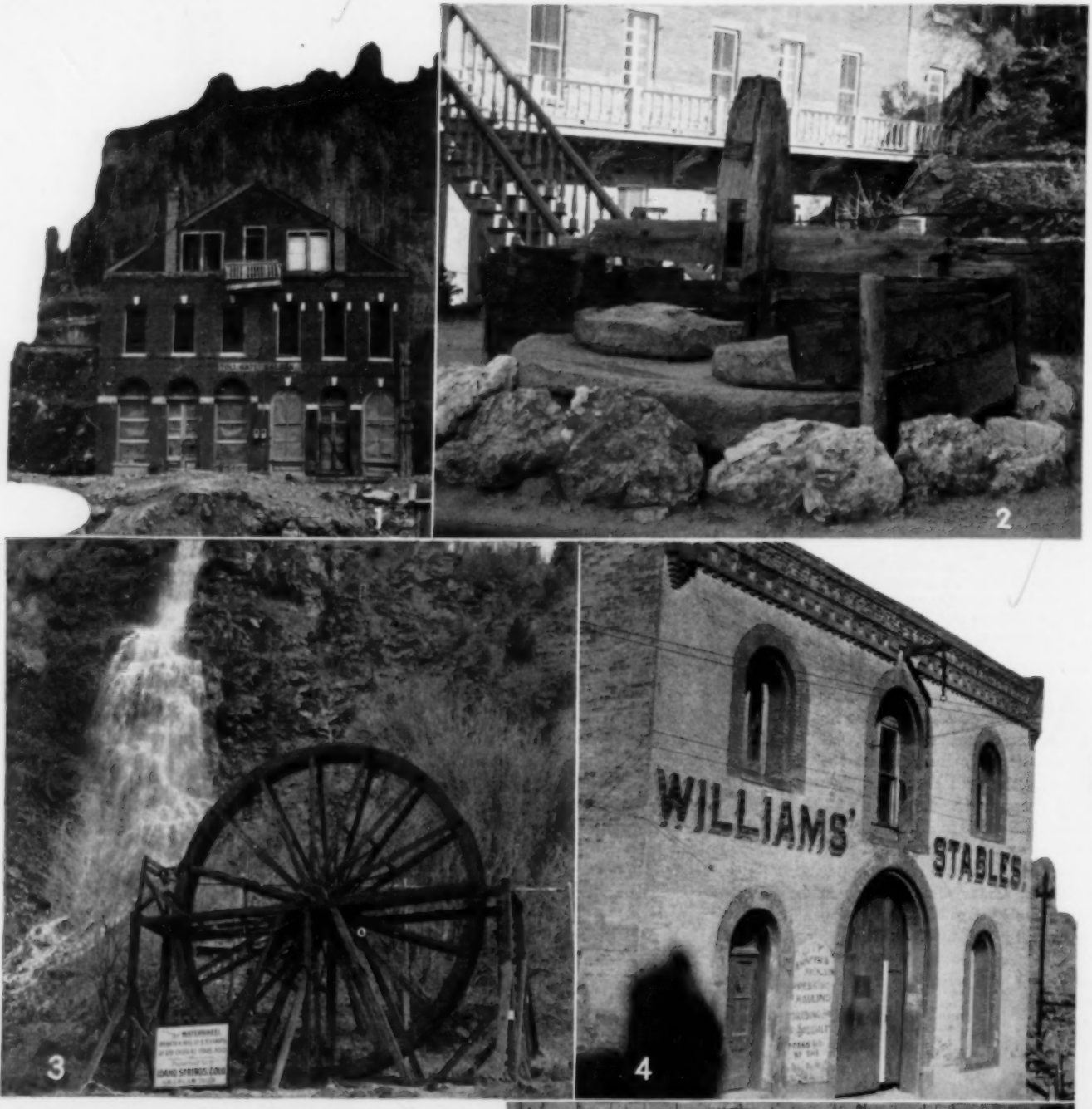
This part of Colorado is intimately associated with the early days of its colonization. In 1858, news that prospectors from Georgia had found placer gold in the streams around the present site of Denver brought a mass influx from the East, but the sand bars were soon worked out and many of the fortune hunters returned home disgusted. Word quickly spread that the boom was a bust. Persevering ones remained, however, and the next spring worked their way up the streams into the mountains. When those who followed Clear Creek came to the fork, some went one way and some the other. A party headed by George A. Jackson chose the larger branch and discovered paying gold deposits in the streambed gravels where Idaho Springs now stands. Another group, led by John H. Gregory, prospected up the smaller branch and found oxidized gold ore on a hillside between what are now Black Hawk and Central City. When carried down to the stream and panned, this loose surface material yielded large amounts of free gold. Gregory, himself, is reported to have taken out $1100 worth in five days.

Word of the strikes traveled fast and precipitated a rush of humanity. Gregory Diggings became a town almost overnight, its name being changed to Mountain City and, later, to Central City because it was the hub of mining activity in what was then Kansas Territory. Some 10,000 persons, including seven white women and five squaws, are said to have congregated in a 4-square-mile area at the diggings that first year. There was not enough gold to go round, so the surplus prospectors fanned out into and across the mountains and discovered minerals in many other sections that subsequently became large producers. From this it is apparent why Central City has come to be known as the "Cradle of Colorado."

Central City was the largest settlement until 1866, when Denver surpassed it. Meanwhile, Golden, or Golden City, as it was originally called, gained in population because of its strategic location as an outfitting point for parties starting into the mountains.

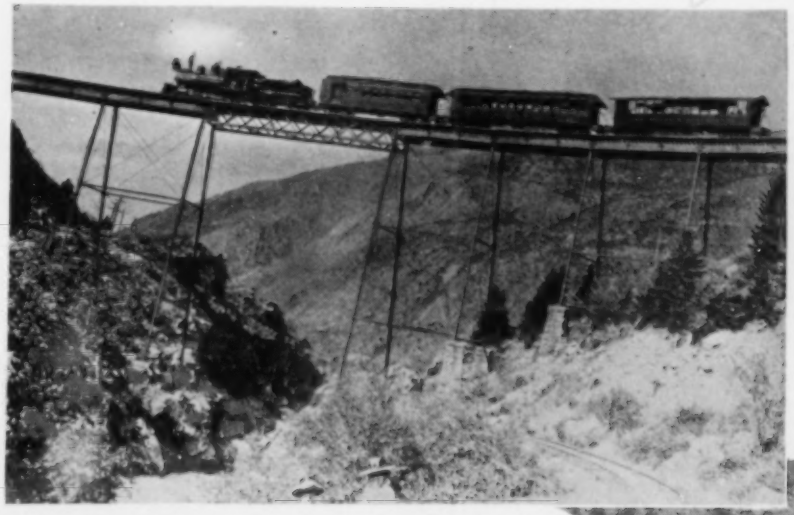
CENTRAL CITY OPERA HOUSE

Erected during the lush days of the mining camp and played in by leading thespians of that era, this showplace was dark for decades after mineral production fell off and the population dwindled. Taken over in recent years by the Civic Theater of the University of Denver and refurbished, it is now open each summer, with prominent Broadway actors, directors, and stage managers participating. Denverites and tourists are its principal patrons.



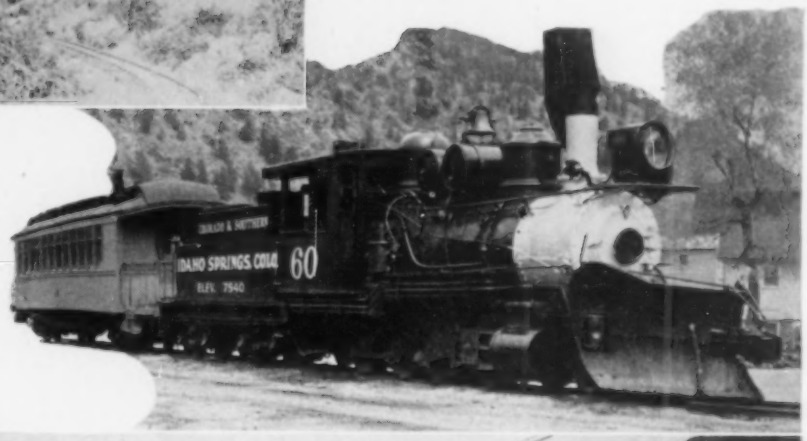
ECHOES FROM THE PAST

No. 1—The first crude roads from the valley to Central City and Idaho Springs negotiated the mountains by way of the lesser defiles on each side of Clear Creek Canyon. Enterprising citizens built or improved stretches of these routes and charged toll for their use. They also erected spacious structures such as the one shown to minister to the wants of the wayfarers. Called the "Toll Gate Saloon," its upper floors served as a hotel. Although situated in a heavily forested area, it was built of brick, no doubt freighted in at great expense. Keystones over the windows and other white members are of cut stone. No. 2—A relic of early mining days is an arrastra that was used to crush ore before stamp mills reached the area. It is in an outdoor museum alongside the Teller House in Central City. No. 3—A water wheel that once operated a 5-stamp ore-reducing mill on Ute Creek. It is displayed beside a cataract at Idaho Springs. No. 4—Livery stables were important institutions in the early life of Central City, and some of them still stand outwardly little changed though long unused. Proprietor Blake (No. 5) went in for art, and someone of the present generation believes in preserving it for posterity, for it is noted in the frame that the sign was painted in 1902 and restored in 1942.



A RAILROAD THAT NO LONGER RUNS

Mining activity gave Gilpin and Clear Creek counties railroad service, and mining decadence took it away. When the Colorado & Southern tore up its narrow-gauge tracks, it left a locomotive and stub train at both Central City and Idaho Springs as mementos of the past. The one displayed at the latter place (center) has a sno wplow on the front. At Central City (bottom) the station still stands, with its semaphore signal set for a train that won't come. Both tiny-wheeled locomotives have numerous appendages, including screens over their smokestacks to prevent sparks from starting forest fires. The picture at the left was taken in 1893 and shows the once renowned Georgetown Loop, with a train crossing the valley on a steel-stilted structure high above the tracks in the right-foreground.



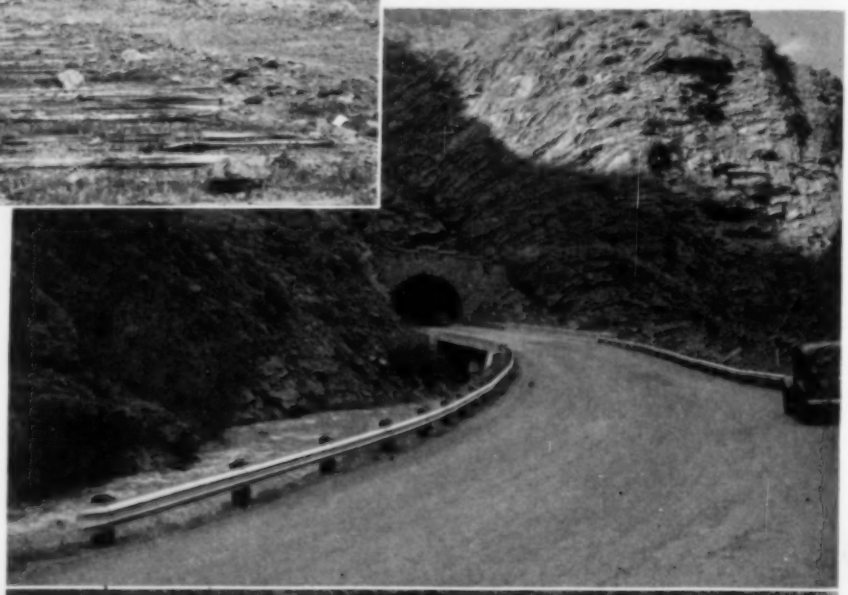
It was the first capital of Colorado Territory, organized in 1862, and it was there that the now widely known Colorado School of Mines was established in 1874, two years before Colorado attained statehood. Fourteen years prior to that time, however, the territory's first tuition school was opened in Golden. Denver and Central City both established public schools in 1862, and it is significant that pupils in the latter place were asked to bring to classes such books as they owned until regular textbooks could be obtained from the East by the slow and uncertain transportation facilities that existed. It is plain, therefore, that the new highway will connect points that played leading parts in the economic and social development of the state.

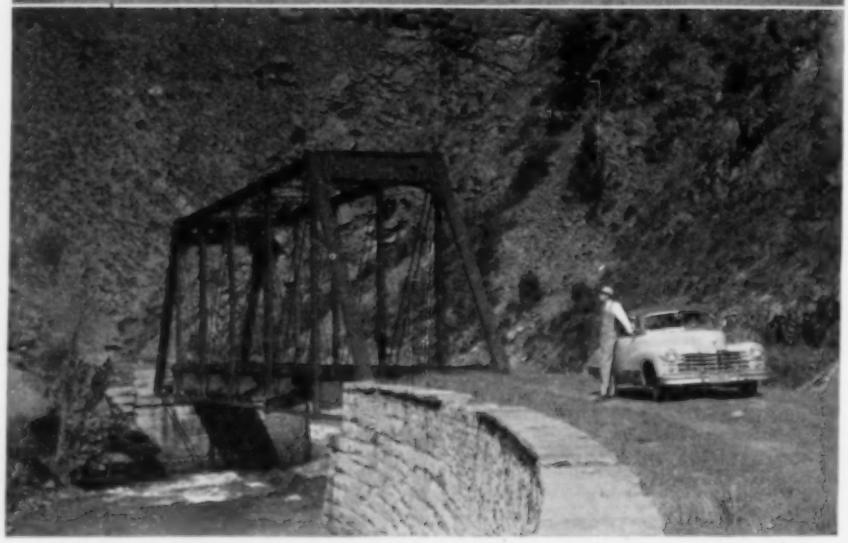
Central City and its neighbor, Black Hawk, are now but ghosts of their former size and opulence, but they are rich in tradition and lore. Horace Greeley and President Grant both included Central City in their itineraries, the President having reached there by stagecoach from Denver in 1873. When he stepped out in front of the Teller House, built by Sen. Henry M. Teller who afterwards championed Colorado's metal-mining interests in Washington, he found himself walking on bars of pure silver extending to the door of the hostelry. It was at the Teller House that the much publicized H. A. W. Tabor met his second wife, to whom he was married in Washington in the presence of President Arthur and other notables while serving a short term as U. S. Senator by appointment.

Once a year, the ghosts walk again when Central City's substantial stone opera house opens its doors for a few weeks under the sponsorship of the Civic Theater of the University of Denver. In the heyday of the camp, such performers as Edwin Booth, E. H. Southern, and Fanny Barlow trod its stage. The revival, although initiated in the doldrums of 1932, caught on and is now one of the cultural attractions of the state. *Camille*, with Lillian Gish in the title role, was the first presentation, and ever since stars of the New York stage have journeyed out each summer to keep the offerings on a high standard.

Although early Central City folks liked their drama, transportation was of more pressing concern to them, especially since the rough roadways to the outside were often blocked by snow in the wintertime. This is evidenced by the fact that the voters at a special election on August 31, 1871, almost unanimously approved a (Gilpin) county bond issue for $300,000 to help finance the construction of a railroad from Golden to Central City by the Colorado Central. At the time they were dependent upon stagecoach and wagons for overland haulage of human beings and freight. Kehler and Montgomery had started stage service from Denver in 1860, with a fare of $5 up and $4 down. In 1865, Ben Holladay, a transportation tycoon of his day, acquired a monopoly and hiked the tariff to $10 each way. That brought competition from another large stagecoach operator, Colonel Butterfield, and fares were run down to $1 a trip. At that point the Wells Fargo Express Company stepped in and bought out all the stage lines.

Quarrying a shelf out of a wall of Clear Creek Canyon by hand drilling,





FROM RAILROAD TO HIGHWAY
Remains of ties of the old rail roadbed are visible in the foreground of the view at the left. The two other pictures show stretches of the new highway that follows the rail route in general but veers from it in places to penetrate mountain spurs through tunnels. The man beside the car is John R. Austin who has helped to make Colorado probably the most tunneled state in the union.

the Colorado Central built its narrow-gauge line, and it was a great day for Central City and Black Hawk when the first construction train puffed into the latter place on December 15, 1872. Later on, tracks were laid 22 miles along the other and main branch of Clear Creek extending southward to serve the mining communities of Idaho Springs, Georgetown, and Silver Plume. To reach the last-named town, the road had to describe a loop to attain height, the upper arc passing over the lower one on a high trestle across the valley. In after years, as many as ten excursion trains a day were run there from Denver to accommodate the sightseers who went to glimpse that then daring example of engineering and to spend a day picnicking in the mountains.

Laid initially with 40-pound rail, which was subsequently replaced with 56- and 60-pound sections, the line had a maximum curvature of 33 degrees and a maximum grade of 4.2 percent. The highest elevation, at Silver Plume, was 9257 feet, and there was talk for a time of carrying the road through a tunnel under Argentine Pass to connect with an existing line out of Leadville on the western side of the Rockies. That would have given the latter city and Denver an incredibly short rail connection—108 miles. Stubborn grades and the fact that half the drivers on the locomotives had to be flangeless or "blind" to negotiate the almost hairpin curves did not prevent this miniature railway from doing a land-office business in freight and passengers. Highlights in its career were: the laying of a third track along the broad-gauge line between Golden and Denver so that the little trains could run directly to Denver; acquisition of the road by the Union Pacific and, ultimately, by the Colorado & Southern in 1900.

The rail line was not taken up until 1941, and anticipation of its retirement somewhat retarded final choice of the canyon as the route for the new highway. Flash floods had periodically washed out sections of the railway roadbed, which had been built too close to the normal level of the creek. With this knowledge and data on the stream flow for many years past, the highway engineers have located the new road above the danger zone and have also specified the generous use of riprap and concrete to protect the banks that are exposed to the turbulent current. The finished highway is to have a 22-foot width of oil-processed paving—except on bridges and in tunnels where concrete is specified—and is to be provided with 4-foot shoulders. Tunnels are to be 32 feet wide and 21 feet high in the clear, after lining. Their portals will be finished with masonry or concrete. Interiors will be concrete lined as far in from the portals as appears essential, and from there on either

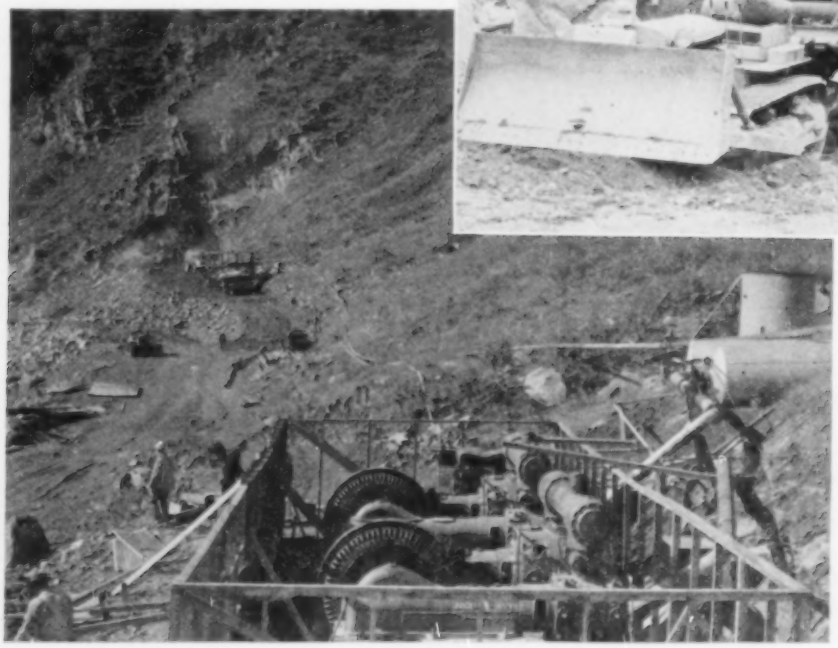
lined or gunited, as formations encountered may dictate.

The east portal of the tunnel being driven by Austin has been excavated 35 feet 9 inches wide to allow for timbering to stand 32x22 feet in the clear. Need for timbering far inside the portals is not expected. Drilling is being done with twelve DA-35 drifters equipped with sliding cone mountings and using 1¼-inch steel threaded for Type-1 Jackbits. Drills are mounted on a 3-deck jumbo having a frame fabricated from steel I-beams and a 20-ton Fruehauf trailer undercarriage provided with pneumatic tires. It is moved to and from operating positions with a Caterpillar tractor. Jumbo decks are 18 feet wide and spaced approximately 5 feet apart vertically, the top deck being 18 feet from the ground. Hinged drilling platforms extend 4 feet from each side at the working end, and these, with rigid drill mounting bars on the jumbo plus 6-foot extension columns on the platform, make it possible for the machines to drill at any desired point on the face.

Holes are spaced on 18-inch centers around the periphery of the bore. The total number of 14-foot holes required per round in medium to hard granite varies from 100 to 125. Cut holes are drilled below an 8x8-foot pioneer bore to break to it, and Hercules 1 to 10 delay primers are employed with 45 percent Dupont explosive. Muck is loaded by a ¾-cubic-yard Northwest gas shovel into 7-yard Koehring Dumptors and spread in courses outside the portals for the new roadway. Holes are started with 1⅞-inch-diameter Jackbits, which are resharpened with reductions in size to obtain an average of six uses per bit. Bits are reconditioned by the contractor in his Denver shop. Forging of Jackrod shanks and of ends preparatory to threading is done with an I-R No. 54 sharpener, and threads are cut with a Toledo rock-drill rod machine. Jackbits are hot milled with an I-R Jackmill and are heated in two oil-fired Jackfurnaces with Wheelco Capacitrol pyrometer control. Quenching is done with special fixtures of the circulating fountain type made by the contractor.

Air at 120 psi. is furnished by two identical 22&13x14-inch XRE compressors driven by 250-hp. synchronous motors using current provided by the Colorado Central Power Company. The approximate 3000-cfm. output of these machines is delivered into twin receivers and carried to the heading by a 6-inch welded line having a flexible hose connection leading to a manifold on the jumbo. Water for the drills is supplied under air pressure from a tank on the jumbo, as is also lubricant, which is fed to the drills through the manifold of a unitized system employing metering valves and a central supply tank. Drilling and mucking operations are assigned to separate 8-hour shifts each 24 hours. Excavation of the canyon wall along the north bank of Clear Creek west of the west portal, where the formation is similar to that encountered in the tunnel, will be done with J50 Jackhamers, with possibly some use of wagon drills, and spoil will be handled as it is in the tunnel.

Work on the project is under the supervision of Mark Watrous, highway engineer for the State of Colorado. Frank Peters is general superintendent for the contractor. "Long John" Austin, mainspring of the firm, is perhaps in a fair way to become just slightly less of a legendary figure in the much-tunneled Rocky Mountain area than is Paul Bunyan with his blue ox in the Northwest timberlands. Since adopting Colorado as his home some ten years ago, he has driven all or part of six major tunnels there: Jones Pass, Carlton, Alva B. Adams, Treasury, and Leadville Drainage. Rock has only recently become well-nigh fluid in the hands of man, and Austin's equipment contrasts sharply with the machinery available to the stage-road and railroad pioneers who worked in the same canyon not many years ago.



STARTING A TUNNEL

The view at the left shows two Type XRE compressors as they were being set up by the John R. Austin Construction Company to supply air for driving an 860-foot tunnel. The portal location and drill carriage are seen in the left-center. Above is a close-up of the carriage taken at the time it started working its way under cover. Pending completion of the stationary compressor plant, air was being furnished by a portable unit, and only two or three of the twelve drifter drills were being operated.

More Water for St. Catharines, Canada

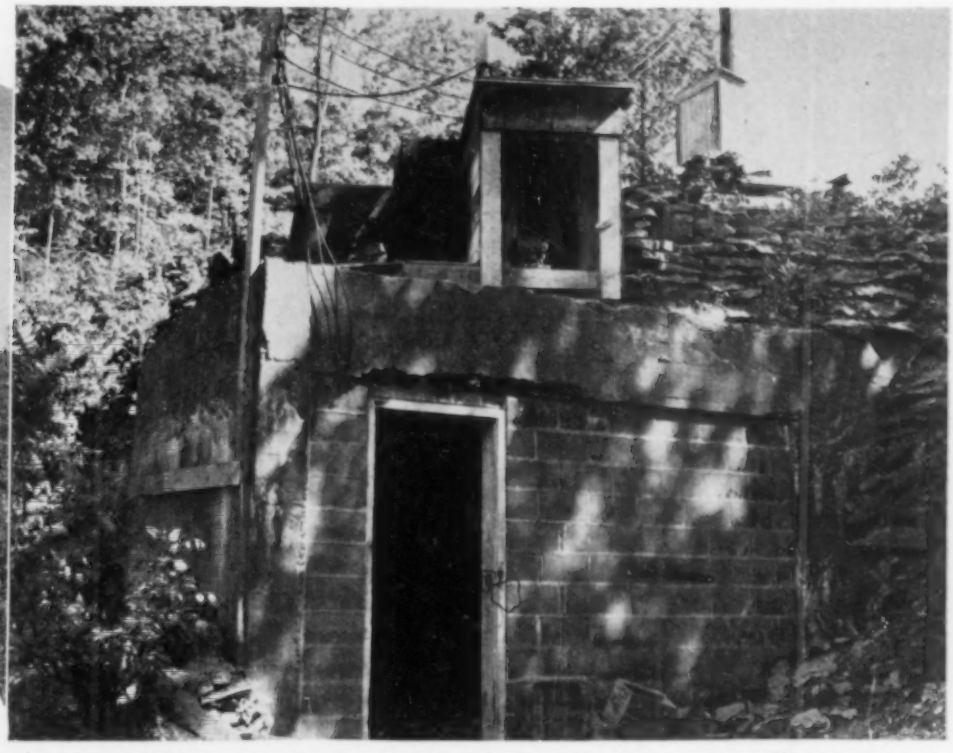
W. G. McLaughlin

TO PROVIDE increased feeder-main capacity from its filtration plant to the city's water-distribution system, the St. Catharines Waterworks Commission has installed two pipe lines in a rock tunnel which, in itself, formerly served as a water conduit. Rock drilling, blasting, and mucking necessary to realign and enlarge the tunnel presented problems which called for special methods of excavation.

St. Catharines is the leading city of the Niagara Peninsula which forms a natural gateway to Canada from the United States. A 40-mile stretch of rich farmland and productive orchards, it is bounded by Lake Ontario on the north and Lake Erie on the south and is separated from the United States by the famed Niagara River. The fruit belt which rims the shores of Lake Ontario produces thousands of tons of fruits and vegetables annually, while in the rolling land apart from the orchards there are large grain and dairy farms.

Geographically situated in the center of the Niagara Peninsula, St. Catharines has become the hub of the commercial and social life of the district. It is the seventh largest city in Ontario, having a population of more than 36,000 persons. Founded in 1790, it is an inland port on the Welland Ship Canal, one of the principal links in the 2339-mile Great Lakes system extending from Belle Isle in the St. Lawrence River to Duluth at the western end of Lake Superior.

Known as the "Garden City of Canada," St. Catharines is highly picturesque, possessing comfortable homes surrounded by well-kept lawns, shrubbery, and gardens. The residents take great pride in the attractive tree-lined streets, the many new public buildings, and the sound policy of civic administration which has established the city over a period of years as one of the most financially secure in Canada. Thousands of tourists are attracted each year by its sandy beaches and cool lakes, its regattas, horse shows, and gala Blossom Festival, its flower gardens and orchards.



ENLARGING THE TUNNEL

To fit two 24-inch pipe lines into a tunnel that had been in service as a conduit since 1913, it was necessary to remove considerable rock from walls, roof, and floor. One portal of the bore, with the housing for a ventilating fan above it, is shown at the upper-right. Compressed air for drilling was supplied by a 315-cfm. portable compressor (above), the delivery line being run down a ventilating hole to the tunnel line 60 feet below the surface. Drilling was done with wet-type Jackhamers, muck was hand-shoveled into side-dump cars, and the latter were pushed out to the dump by manpower.

Numerous golf courses, tennis courts, and bowling greens provide added recreation, and motorists travel to St. Catharines over the most up-to-date of express highways—the 4-lane Queen Elizabeth Way.

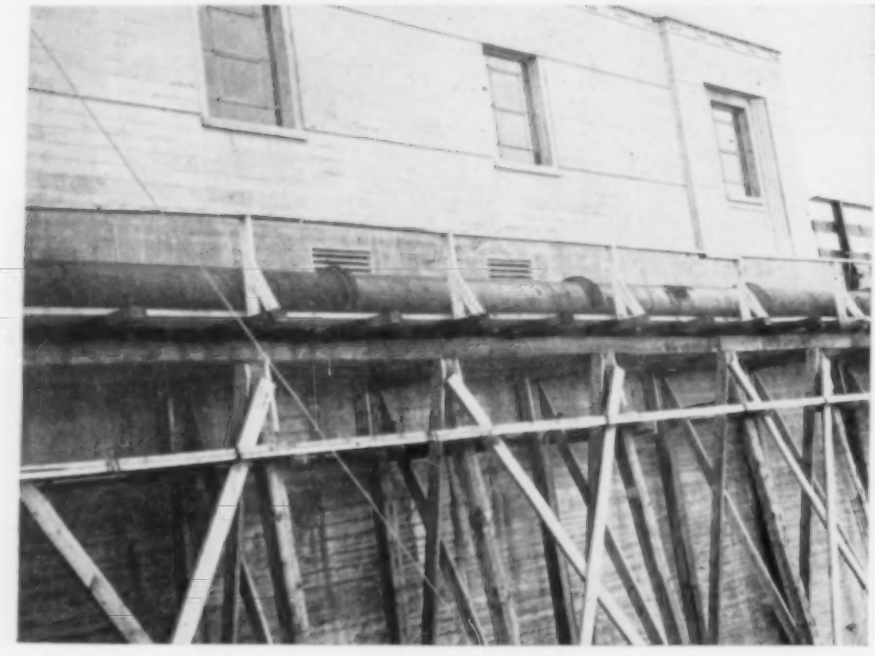
Agriculture is a basic factor in the life of St. Catharines, but it was only natural that a community so favored by direct water, rail, and highway routes should become an industrial center. Today it is the home of diversified industries, but it neither looks, smells, nor sounds like a busy manufacturing center. This is due to widespread electrification of machinery made possible by abundant hydroelectric power.

Because of its steady growth, the city has again and again been faced with the need of more water. Several changes have been made in the original plant in an effort to increase the supply, the latest one involving the laying of 1½ miles of new feeder mains in the existing tunnel. This will insure St. Catharines water free from contamination and will almost double the system's present capacity. The waterworks dates from 1878 when a dam was built across Beaver Dams Creek just upstream from Decew Falls, creating a storage reservoir 65 acres in area at a point 160 feet above the city level. This difference in elevation enabled the water to flow by gravity and to maintain a pressure of 65 to 70 pounds per square inch in the city mains. As St. Catharines continued to grow, the watershed became inadequate, particularly in the dry season when demand increased and run-off diminished. During these periods water was diverted from the Welland Ship Canal into the reservoir, and at the present time substantially the whole supply is obtained from this source.

The original 16-inch-diameter cast-iron feeder, which has a daily capacity of 2½ million Imperial gallons (three million U. S. gallons), was installed in 1879 and is still in service. In 1913 a second feeder main was provided but did not follow the same route as the first one. It consisted of a 4000-foot tunnel extending from the reservoir to the face of an escarpment or cliff and of 15,000 feet of 24-inch-diameter cast-iron pipe from the hillside to the city. From 1913 until 1926 the water was chlorinated but not filtered. During the latter year, a filtration plant was built at the tunnel intake and has been in operation ever since. It has a capacity of ten million Imperial gallons per day and feeds into an adjoining storage reservoir. The daily consumption varies from three to eight million gallons.

The tunnel lies at an average depth of 60 feet and follows limestone strata sloping upward from the reservoir to the escarpment on a 0.5 percent grade. It passes under the forebay and headrace of the Decew Falls power plant, which is one of the oldest hydroelectric projects in Canada. The bore varies in height from 4⅔ to 7½ feet and in width from 3½ to 8 feet. It was not lined. Records indicate that when it was driven there were no signs of seepage. Since then, however, a number of leaks have developed and been a potential source of pollution of the city's water supply.

Inasmuch as attempts at grouting to



TEMPORARY WATER LINE

While the tunnel was out of service, it was necessary to provide temporary facilities to deliver an adequate supply of water to the city. To this end, 5000 feet of 24-inch cast-iron pipe was laid on the surface. A section of it is shown passing in front of the headworks of Decew Falls Power Plant on a trestle.

check seepage have not always been successful—water stopped at one point often reappearing a few feet away, the St. Catharines Waterworks Commission decided to lay two 24-inch-diameter pipe lines in the tunnel and thus eliminate the danger of raw water mixing with the supply leaving the filtration plant. One of the conduits was to connect with the present 24-inch cast-iron feeder, and the second with a new line of the same type and size leading to another section of the community. Class 50 Transite pipe, manufactured by the Canadian Johns-Manville Company, Ltd., was selected because its light weight and ease of joining made it especially well suited for use in the restricted underground space. It weighs approximately 55 pounds per lineal foot, or 715 pounds per 13-foot length.

A survey was made of the tunnel, a center line was established, and levels and cross sections were taken at 20-foot intervals. Because the bore zigzagged from the center line, considerable rock had to be drilled and blasted from both walls. The roof and floor followed seams between the layers of limestone, and for 90 percent of the tunnel the grade was uniform. However, for about 350 feet of its length the seam dipped, making it necessary to remove from 6 inches to 2 feet from the roof to give sufficient headroom for assembling the Transite pipe, which called for a minimum section of 6x6 feet.

Drifters could not be utilized because of limited space and shallow holes, so excavating was done with two JA-55 Ingersoll-Rand Jackhamers equipped for wet drilling and using 1-inch hexagon

LOWERING TRANSITE PIPE

Pipe to be installed in the tunnel was lowered over a cliff to the portal of the bore at Decew Falls by a gasoline-engine-driven derrick.

PLACING PIPE IN TUNNEL

The view at the right shows a length of pipe being jacked into the coupling that connects it with its neighbor. A section of the completed dual line is pictured below. Inspection of the lines after they had been filled with water revealed that only two of the 602 joints leaked.

steel and Jackbits. Two men with one machine averaged 90 feet of hole in an 8-hour shift. Most of the drilling was horizontal, the holes varying in depth from 18 inches to 4 feet. Where it was necessary to put holes in the roof, one man held the drill in place with a pry while the other operated it. To avoid excessive overbreak, holes were spaced from 2 to 3 feet apart.

Air for the Jackhamers was delivered a maximum of 3000 feet from the 315-cfm. portable compressor on the job. The first 800 feet of the air line was 3 inches in diameter, reducing to 2 inches for the remainder of the distance. With air at a constant pressure of 100 psi. at the compressor, the two Jackhamers operated satisfactorily when 3000 feet away from the machine. Water at 40 psi. was piped into the tunnel, and rubber hoses served to carry it and the air over the top of the muck piles to the drills. The piping was extended each day up to the muckers. A power line was run the length of the bore and 100-watt lamps were installed at 50-foot intervals. The wiring was held in place by wooden brackets wedged in the walls and roof, and switches were located every 500 feet.

Two 8-hour mucking shifts were needed to take care of one drilling shift. Blasting was done at the end of the day shift, using 40-percent Forcite and shooting from 20 to 30 holes at a time. The electric blasting caps were connected to the lighting system, and the charges were set off by throwing the main switch outside the tunnel. A suction fan at the entrance cleared away the fumes after firing. The rock was drilled, blasted, loaded into side-dump cars, and disposed of in the gorge at the foot of Decew Falls, passing switches being located at wide spots in the bore at approximately 500-foot intervals.

Excavating required slightly more than three months working two 8-hour shifts six days a week. A total of 2130 cubic yards of material was removed, and the lineal footage drilled equalled 6.5 feet per cubic yard of rock. With this phase of the job completed, a concrete slab 5 feet wide by 6 inches deep was laid on the tunnel floor, leaving a 6-inch trench on each side to carry away seepage from the walls and roof. A 9-cubic-foot concrete mixer was set up on top of the cliff above the tunnel mouth, and the concrete was passed down a chute into a hopper and dumped into narrow-gauge cars which were pushed into the tunnel. As the work progressed, the track was moved to one side until the slab had set, then relaid on the concrete in preparation for the Transite pipe. In addition to providing a smooth surface of even grade, the slab also offered an excellent foundation for the precast concrete cradles which support the two 24-inch feeder mains.

A truck hauled the lengths of pipe from the stock pile to the crest of the cliff, where a small gasoline-powered stiff-leg derrick lowered them to the tunnel opening. There they were loaded on the narrow-gauge cars whose boxes had been replaced by timber cradles to hold the pipes during their trip into the tunnel. At the end of the run they were laid in the precast concrete cradles and assembled by jacking, as shown in one of the accompanying pictures. Joints consisted of a collar and rubber gaskets which were jacked over the machined ends of the pipe. Where Transite pipe was connected with a cast-iron member the joint was poured with Hydrotite, a self-calking compound.

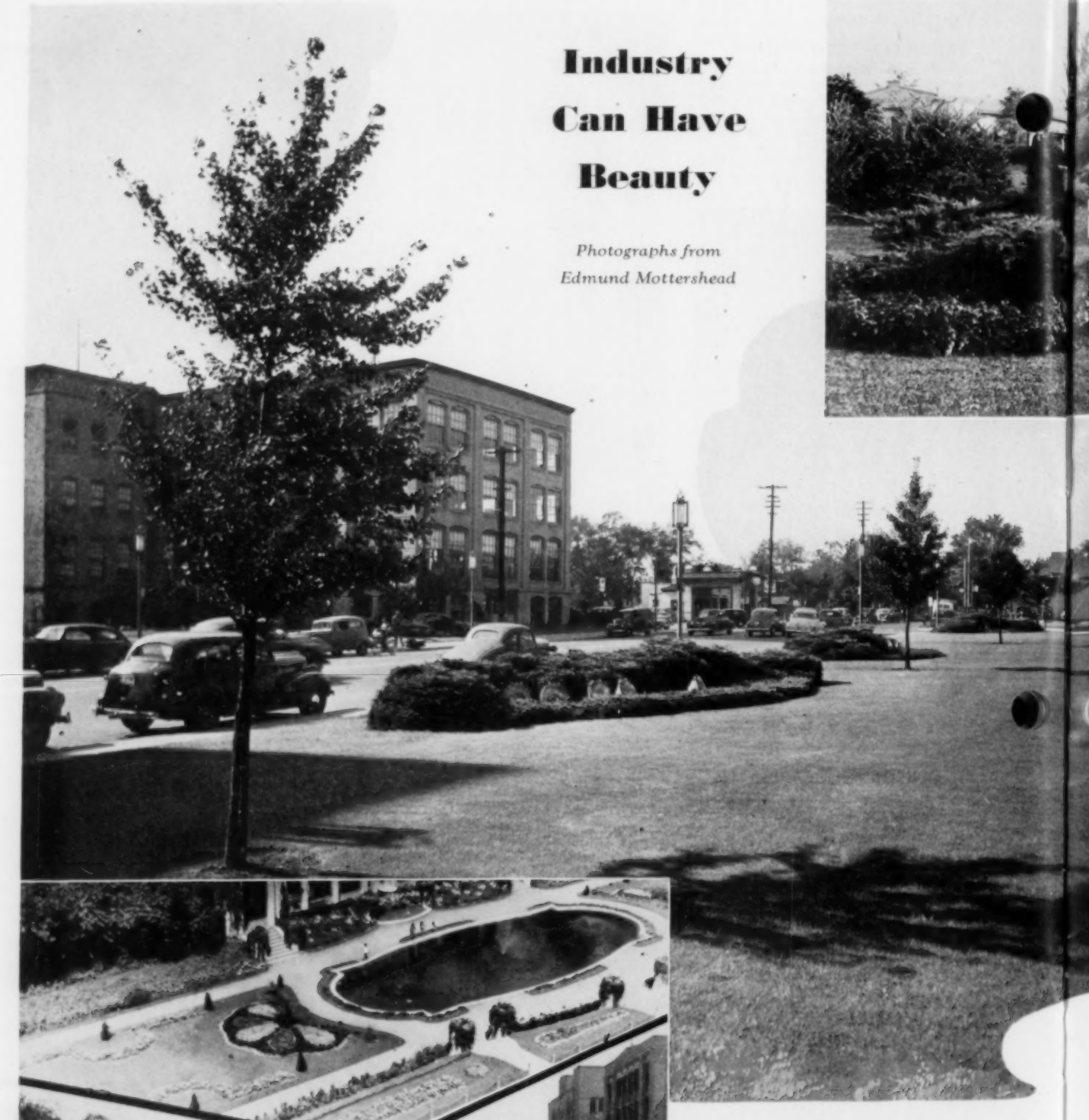
Four men assembled an average of 545 feet of pipe each 8-hour shift, with a maximum performance of 900 feet. Where leaks occurred in the tunnel and the joints became wet some difficulty was experienced in jacking the collars over the machined ends owing to the rubber gaskets slipping instead of rolling. When this happened the collar had to be backed off and a fresh attempt made.

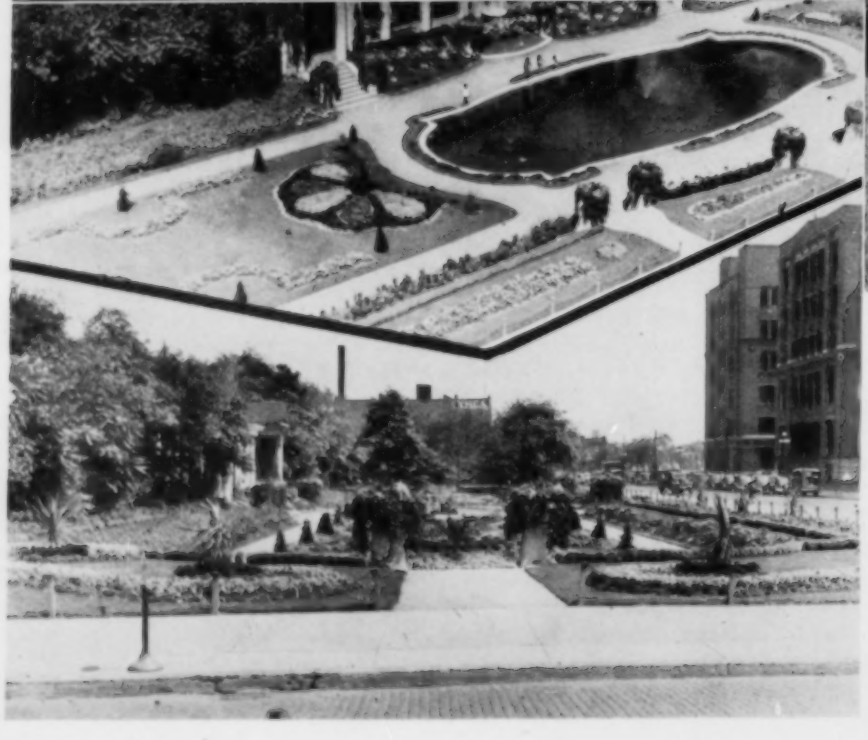
The Transite pipes tap the reservoir through 24-inch-diameter cast-iron risers in a shaft that extends to the level of the reservoir floor. At the low point in each line was installed a 24-inch cast-iron tee fitted with a 4-inch valve to provide drainage. When the job was completed, the water supply was diverted from the temporary conduit to one of the Transite pipe lines and through the existing cast-iron feeder main into the city. The line in operation has proved entirely satisfactory, and as soon as the second one is ready for service St. Catharines will have a distribution system capable of handling up to 18½ million gallons of water a day.

The work described has been carried out for the City of St. Catharines Water Works Commission by the local contracting firm of Aiken & MacLachlan, Ltd. The author served as engineer for that firm.

Industry Can Have Beauty

Photographs from Edmund Mottershead





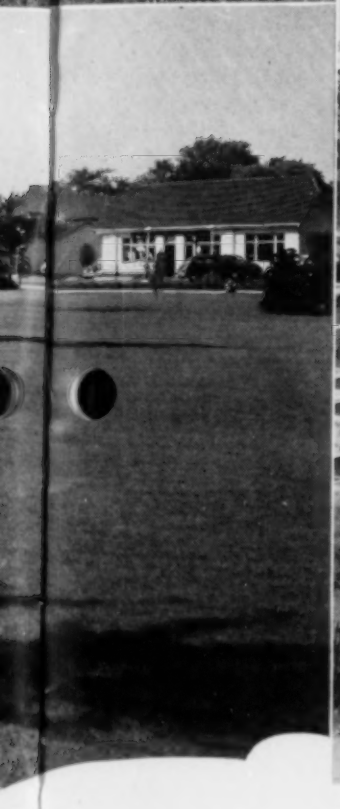
Above is pictured the spacious lawn of the National Cash Register Company, Dayton, Ohio. The firm's president, S.C. Allyn, says: "Experience shows that money spent in this way is a profitable investment."

•

Formal gardens at the headquarters of Sears, Roebuck & Company in Chicago (left), and a partial view of them as they appear to employees from plant windows. The gardens are changed from year to year and were planted to vegetables during the war.

Although cement is essentially ground rock and productive of dust, the plants that make it are nearly always surrounded by attractive grounds. Shown at the left is a perfect-safety-record monument standing amid attractive shrubbery in front of the main office of the Southwestern Portland Cement Company at Osborn, Ohio.

Landscape architecture is at times a delicate art and an engineering science. Great care must be exercised in moving trees to preserve life and root structure. The diameter of the "ball" shown below is 22 feet and its estimated weight is 75 tons. A tree this size is frequently valued at thousands of dollars.

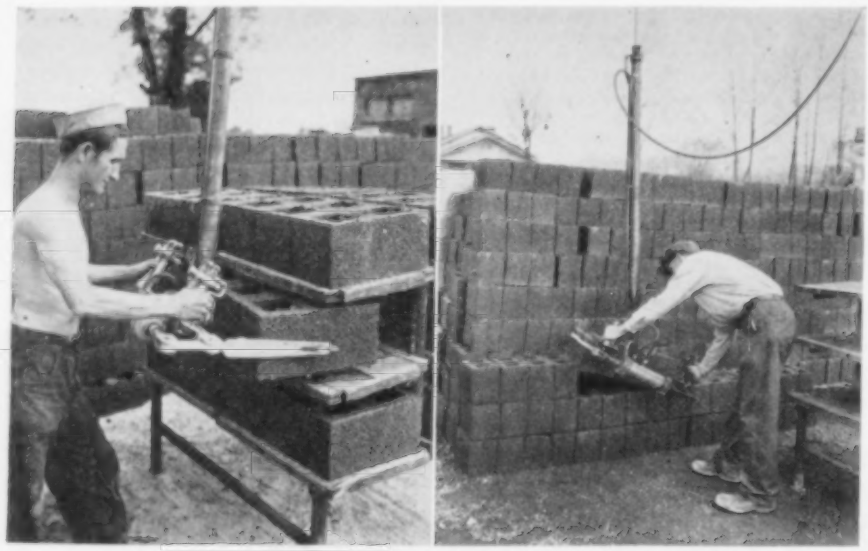


INDUSTRY is becoming more and more aware that it pays to give its plants attractive settings. Executives are mindful of industry's traditional reputation for smoke and grime, ugly structures, and barren surroundings that cause neighborhoods to deteriorate and new homebuilders to shun them. To remedy the situation, they are dressing up buildings and entrance gates and beautifying grounds with lawns, flowers, shrubs, and trees.

The trend towards landscaping is aided by the migration of many factories from congested urban areas to spacious rural locations. But even in large metropolitan centers, where land is at a premium, many concerns are making their premises appealing to the eye. They are motivated by more than an aesthetic sense. Experience has proved that pleasant surroundings promote employee morale and increase worker efficiency. A survey by a group of Chicago establishments revealed that planting barren grounds with lawns curbed vandalism and sharply reduced the bill for replacing broken windows. Then, too, lawns often pay for themselves by reducing the amount of abrasive dust that ordinarily enters buildings and adds considerably to the normal wear on expensive machinery.

In sections where it is impractical or impossible to grow grass, the appearance of a place can be improved in other ways. Flagstones laid in attractive patterns, and the judicious use of fine gravel offer means of treating areaways, courts, and stretches where foot traffic is heavy. Hedges likewise are of advantage in such locations, especially to set off walks and to channel traffic into parking lots. In addition to serving their utilitarian purpose, walks in themselves can beautify by building them of flagging, bricks, or colored concrete and by flanking them with trees, shrubbery, and gardens.

Walter S. Johnson, president of Friden Calculating Machine Company, San Leandro, Calif., says: "We believe shrubbery, flowers, and a spacious lawn are not only good advertising but materially help in maintaining a high appreciation on the part of our employees of the necessity for orderliness and cleanliness inside the plant. We are convinced that landscaping a factory (below) is just as important as landscaping a home."



PNEUMATIC CLAMP ASSEMBLY

Pivoted to the lower end of the air hoist, the clamp operates with the facility of fingers in gripping and stacking concrete blocks. In the picture at the left it is removing three 8x8x16-inch blocks at a time from the decks of curing racks having no overhead clearance. As they come from the molding machines, the blocks are set on the shelves in groups with a minimum of 1¼-inch space between them to permit insertion of the clamp arm. In stockpiling blocks in the yard for shipment they may be similarly stacked for transfer to truck or railroad car by Yardhoist, or they may be cubed—placed close together as shown at the right—for handling by a fork lift truck. A different type of clamp is used to handle cored-end or plain blocks set on end.

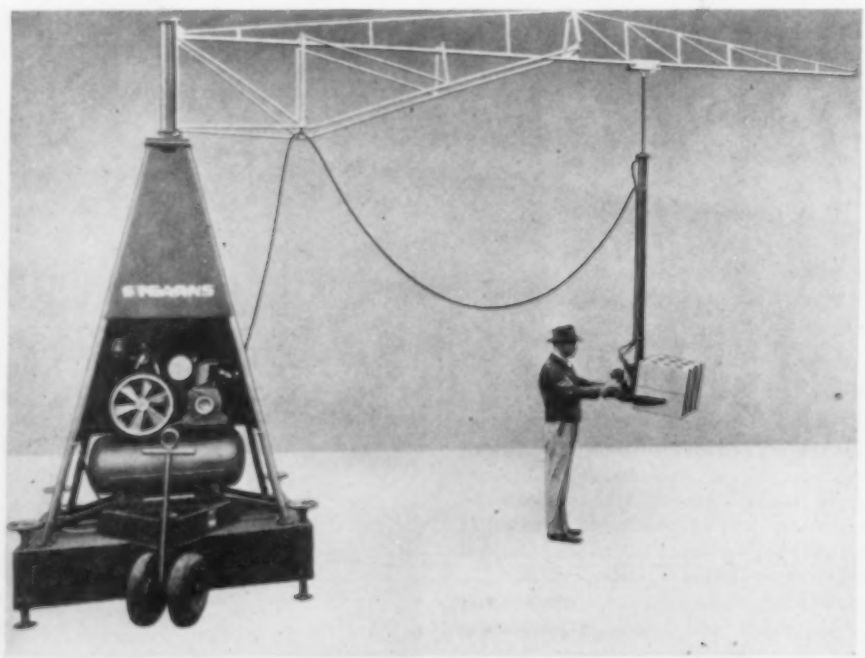
Handling Concrete Blocks in Yard by Air Hoist

THE manufacture of concrete blocks has become an industry of sizable proportions in the United States and has reached a highly mechanized state, including handling of the finished product. Until recently, the latter work had to be done manually and was both time-consuming and costly because the blocks have to be moved several times before they leave a yard. Upon coming from the machines, the freshly molded blocks are placed on racks to undergo curing and hardening. From there they go to stock piles for drying, and when ready for shipment are loaded on railroad cars or trucks.

Today, up-to-date plants are equipped to handle the hardened blocks mechanically. The Yardhoist, which was developed by Stearns Manufacturing Company, Inc., to take over this materials-handling job, is of an especially adaptable type. It is a portable unit that can be quickly spotted where needed, and has a boom 20 feet long that can be swung completely around. Lifting is done with an air hoist—a 72-inch vertical pneumatic cylinder (standard size) that permits piling blocks 6 feet high. The length of the cylinder or piston stroke is determined by the height of the racks or stock piles with which a hoist is used.

Pivoted to the air cylinder is a clamp assembly with movable arms to allow for about 2-inch variation in size of groups of blocks. This clamp is actuated by an air cylinder of its own which, like the hoist, is controlled by triggers at the operator's fingertips. Air at a minimum pressure of 90 psi. is required for both units and is supplied either by a small gasoline-driven compressor mounted on the base of the Yardhoist or by a stationary machine, which is an essential part of the equipment of every concrete-block-making plant.

Being free to move vertically and horizontally, and with the clamp assembly mounted so as to rotate in a vertical plane, the Yardhoist can do all the work the men did, says the manufacturer, and do it faster and with less chance of breakage. It can reach in between the decks of curing racks with no headroom and remove blocks in groups of three or six, depending upon how they are set; deposit them on stock piles with a space between adjoining groups, or cube them—place them close together—for handling by fork lift trucks; and pick them up again and load them for shipment. Whether operating between curing racks and stock pile or between stock pile and truck, the equipment handles on an average eight hundred 8x8x16-inch blocks an hour. Although designed primarily for the concrete-block maker, there are indications that it may similarly serve the ceramic industry and even the lumberman.

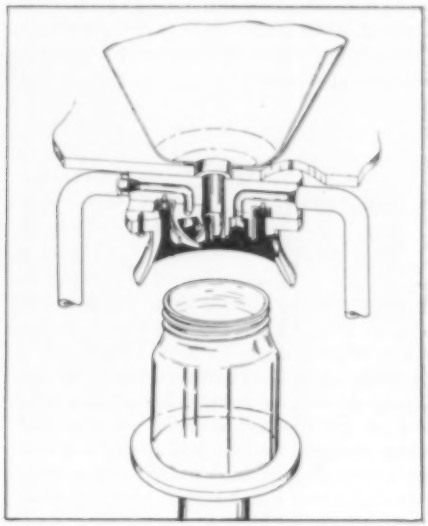


THE MOBILE YARDHOIST

This unit is self-contained and can be quickly moved from one to another working position. Mounted on the base is a gasoline-engine-driven compressor that delivers air to operate the pneumatic cylinder and clamp which require from 5 to 7 cfm. at a minimum pressure of 90 psi. The over-all height of the truck and 20-foot boom is 13½ feet. Stability is insured by ballast such as sand, gravel, or concrete placed in wells in the truck base. Unit is shown handling six standard-size blocks, which is general practice in loading them for shipment.

ROTARY VACUUM FILLER

Designed for production-line use, this powder-packaging machine is equipped with variable-speed drive so it can be synchronized with other equipment. There are a number of filler heads in the cylindrical housing, and as the empties are delivered by traveling conveyor they are brought into dust-tight loading position by air-operated pistons. Below are shown details of the filler-head assembly with a glass jar at rest on the lift platform. The hopper nozzle is centered between two screened compartments on which vacuum is alternately pulled and released by means of opposing suction lines. This action takes place several times during the filling cycle, causing the powder to fall freely into the container and to settle compactly so that the amount in each will be of predetermined weight or density.



Dust-Free Packaging of Powdered Products

TWO difficulties in the packaging of powdered products have been wasteful clouds of dust on the working floor and lack of uniformity in the volume or weight of the material packed. Both these problems are licked, we are informed, in the Carter Vac Filler that was introduced in 1938 and improved upon by General Mills, Inc., under an exclusive manufacturing and sales agreement with the Carter Engineering Company. All moving parts are now shielded either by conventional seals or by inclosing them in separate dust-tight compartments, and packages—that is, contents—of standard weight and density are insured by automatic and continuous vacuum control.

The machines are designed to handle any nonfree-flowing product such as talcum and face powder, cocoa, flour, and insecticides, to list only a few, and to fill barrels, cardboard containers, tins, jars, and bottles of varying shapes and sizes with large or small openings. There are single-head units fed manually, and rotary machines served by conveyors and equipped with from 8 to 24 filling heads. Basically, each of the latter consists of a hopper with a nozzle, and of two suction tubes opening into screened compartments.

The container to be filled rests on a pneumatically operated cylinder piston that raises it to the charging position, where it is forced against a seal ring to form a dust-tight connection between its mouth and that of the hopper. Vacuum is then pulled and released alternately on the opposing screened compartments; and as the powder encounters no air resistance it falls freely into the container and is "tamped" at the same time to a predetermined density. In the case of a carton that is likely to collapse, pressure inside and outside is equalized by the use of a shroud that covers all but its opening and by drawing a vacuum also on the space between the shroud and the container.

The capacity of the equipment depends, of course, upon a number of factors, but the fillers are said to work at high speed regardless of the material and of the type and size of the package. Containers up to 1-pound are handled at rates varying from 100 to 300 a minute, depending upon whether 8-, 12-, 16-, or 24-head machines are used; 5-pound cans at minimum and maximum speeds of 45 and 120 a minute; and a hundred and twenty 225-pound barrels can be filled in an hour.

Oranges Wrapped in Pliofilm by Aid of Vacuum

WEIGHT loss and spoilage of oranges between the time of shipment and consumption are being reduced to a minimum by the Oak Hill Cooperative fruit-packing plant, the first to wrap each one in Pliofilm by a machine developed by the Florida Citrus Exchange in conjunction with The Goodyear Tire & Rubber Company and the Florida Agricultural Experiment Station.

After washing, waxing, polishing, sorting, and grading, the oranges are carried five abreast to the top of the machine and chuted to a revolving cylinder which feeds them between two rolls with cupped surfaces. As the drums turn, the fruit falls into the depressions in the lower one; but before doing so, two Pliofilm sheets, that have been softened by passing them over heated rolls, are gripped by a series of fingers on cam tracks on both sides of the machine and stretched to six times their normal size. As it travels along with the drums, the plastic material is drawn into the cups by vacuum, and as the mating halves come together the oranges are sealed between the sheets. Next, the fruit goes to a cupped conveyor where surplus film is cut off by heated wires and removed by revolving brushes. The machine can wrap about 800 oranges a minute, it is claimed, at an estimated outlay of $0.01 per orange.

This and That

Northern Camp Sans Dentist

An unusual advertisment appeared recently in *The Northern Miner*, published in Toronto, Canada. The Dominion's young and spectacular far-north gold-mining camp of Yellowknife needed a dentist, so the local trustee board inserted a display ad. The 2100 residents in the settlement on the shore of Great Slave Lake had been paying $200 plane fare to fly south to Edmonton, Alta., whenever their teeth needed attention.

* * *

Not Many Left Like This Man

John A. Potts is a Pioche, Nev., miner who evidently doesn't believe in absenteeism. He had a bit of trouble getting to work recently, but he made it. According to *The Mining and Contracting Review*, Potts went to Las Vegas on a Sunday and was stranded when his car broke down. He spent a lot of time trying to get it fixed without success and then realized that he had to act quickly or he would miss the Monday night shift. He chartered a plane and had the pilot fly him back. They soared low over Pioche and signaled to anyone who might be watching from below. Sheriff Fogliani and Deputy Seger saw the signals and sensed that something was amiss. They followed the plane to the rodeo grounds, where it landed. The officers drove Potts back to town and he made a fast sprint to catch the Caselton bus that took him out to the mine.

* * *

Electronic "Hot Dogs" Are Coming

A hint of what is in store for us in the way of automatic vending machines is contained in an item in the *Erie Works News* published by General Electric Company. The company has developed an electronic appliance that cooks a frankfurter inside a bun in a paper wrapper. The Canteen Company, which controls cigarette- and candy-vending machines, will begin putting out this new device as soon as it can arrange to manufacture it in large quantities.

* * *

Underground Electric Haulage

There are more electric railroads underground in the United States than on the surface. Once no urban settlement was considered worthy of being called a city unless it boasted electric-traction lines. Now the trend is towards bus transportation on the streets, with electric subways in those communities that are large enough to have them. Most underground haulage systems are in mining districts, not in centers of population. Our nation's mines have around 50,000 miles of electrified railroads.

* * *

Marine Air Horns

About the only protection boats have against collisions with other craft in fog or at night is an effective warning signal. For small vessels, air-blown horns are considered the best. Water spray does not interfere with their operation, and they have a powerful, penetrating tone that makes them audible for miles. During the war, our PT and Mosquito boats were equipped with such horns, and they are used extensively by U. S. Coast Guard craft, private yachts, speed boats, and ferries. One type, made by Buell Manufacturing Company, has a sound-generating unit consisting of a simple disk valve between two openings. Air causes the valve to vibrate, and the pitch is determined by the length of the bell. Some horns have two bells of different lengths, producing dual tones that blend. Air horns are blown with pressures up to 200 psi., and a storage receiver is commonly placed near them. If a vessel is not supplied with air, a small compressor, driven by belt from the main engine or independently by an electric motor, is furnished by the manufacturer.

* * *

Jingles Promote Safety

The Michigan State Highway Department has turned to roadside jingles as its latest move in a campaign to reduce the high accident rate on a road between Bay City and Standish. Spaced 5 miles apart on the 28-mile stretch, the jingles are arranged in components on boards set at 150-foot intervals. Here are the jingles: "Drive with Caution—Check Your Speed—Think it Over—While You Read." "Do Not Use—The Middle Lane—To Pass Unless—It's Safe and Sane." "Watch Crossings—Pedestrians Too—Highway Safety—Is Up to You." The department decided to try the idea when other efforts to bring about safe driving failed. In a recent 6-month period nineteen persons were killed and many others were injured on this section. It is well constructed from an engineering standpoint, with wide curves and good visibility for long distances. Investigations have disclosed that 94 percent of the accidents were attributable to recklessness, speeding, driving too slow during peak-traffic hours, use of the center lane when not clear, and motorists falling asleep at the wheel.

* * *

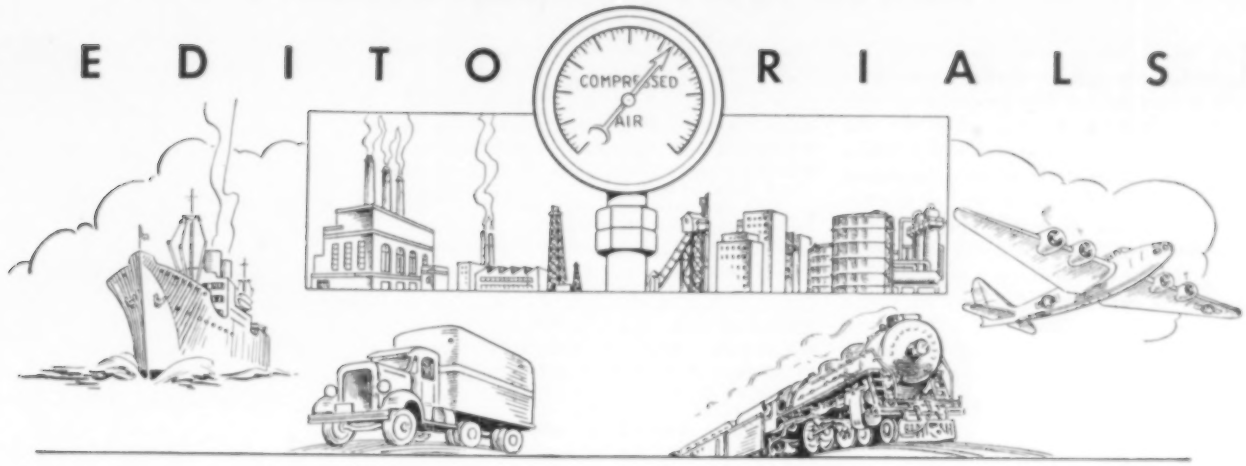
Some Gas Pipe Line History

The nation's first compressor station for transmitting natural gas is believed to have been erected by Charles E. Hequembourg of Dunkirk, N. Y., a pioneer natural-gas engineer. It was located at Rixford, Pa., and pumped 6,000,000 cubic feet of gas daily to Bradford through 11 miles of 7-inch cast-iron pipe. The original compressor was a duplex steam-driven unit with 24-inch steam cylinders, 26-inch compression cylinders, and a 30-inch stroke. Our source of information did not state when this plant went into service. The pioneer high-pressure station was built at Greentown, Ind., in 1892. It pumped natural gas to Chicago, Ill., through 120 miles of 8-inch line. The system was designed to operate at 600 pounds pressure, but this figure was never attained. Before the line was completed the gas was compressed to 700 pounds pressure and shipped to Chicago in large cylinders.

"We can't start excavating yet—no spectators."

"This ground is sure hard. Caddy, hand me my air hammer."

EDITORIALS



ROCK-DRILLING COSTS

THE average citizen probably doesn't consider that the cost of drilling rock concerns him. Actually, it affects his pocketbook almost everywhere he turns. All the metals that enter into his home, his automobile, the office building or factory in which he works, the stores he buys in, the schools his children attend, and even into the hearse that carries him to his final resting place have to be extracted from the ground in the form of ores, and drilling is one item of the cost of mining.

Rock likewise must be excavated to build the railroads and highways that transport him, as well as the engineering works that provide him with water, electricity, gas, and sewage disposal. This enumeration could be carried on indefinitely, but we have cited enough things to show that the economics of rock drilling touches the lives of millions of persons that have never seen a rock drill and likely never will. It is obvious that a penny saved here and there in drilling almost any rock or ore will be reflected in tremendous aggregate savings to the populace at large.

Even though he doesn't know it, the man in the street has an interest in every improvement in rock-drilling machinery and in every advance in the art of applying it. Fortunately, these betterments go on continually without any pressure on his part. Competition among drill manufacturers, among mining companies, and among contractors insures that every effort will be exerted to register maximum gains in drilling technique. This progress is a chain reaction, and the manufacturer is its first and most important link. The better he designs and makes his tools, the better the performance mines and contractors will be able to get out of them. But, even though the drills furnished them are good, it devolves upon the users to institute methods of application that will yield the best possible results.

Many things enter into the cost of drilling rock. There is a tendency to stress inches drilled per minute as a measure of efficiency, although it is more to the point to emphasize footage drilled per shift or per day, as this determines rock or ore output and the profit obtained therefrom. To illustrate this point, let us assume that a mine is producing high-grade ore on which it makes $5 a ton. An increase in drilling performance that permits boosting the output 10 tons a day will raise the profit by $50. The work a given drill will do in an average day is, then, an important thing to know when buying equipment of this type. Other essential facts are how much air the drill uses and what it costs to keep it in fit operating condition.

Because a rock drill tends by its action to pound itself to pieces, it is inevitable that some expenditures are necessary to replace worn or broken parts. It is pertinent to note, however, that upkeep costs have been steadily going down while drilling efficiency has been rising. For this the metallurgist perhaps deserves major credit. He is giving drill designers tougher, more durable materials all the time.

The records of large tunneling operations conducted during the past 30 years furnish a good index of the downward trend of drill-maintenance costs. Since the Hetch Hetchy water supply tunnels in California were driven, starting in 1914, upkeep costs per cubic yard of rock excavated have decreased approximately 80 percent. Taking the Hetch Hetchy figures as 100, we find that by the time the Moffat railroad tunnel was constructed in Colorado, 1923-27, there had been a drop to around 50 or 60. In tunneling the Colorado River Aqueduct during the years following 1932, upkeep costs were at about the level of 25. A further decrease to around 20 has been registered since that time.

To sum up, each dollar the contractor formerly spent for this item has now shrunk to about 20 cents. In the aggregate, this represents a sizable sum, which is a clear donation from the drill manufacturers. The same benefits have been given the mining industry. When it is considered that millions of yards of rock and ore are extracted every year, it can be readily seen that this has had the effect of easing the strain on the pocketbook of John Q. Public.

•

SATURDAY'S ACCIDENTS

HIGHWAY authorities are pointing out a peculiar and regrettable effect of the 5-day week that has been widely adopted in industry. Presumably, the greater leisure it affords is intended to promote health and well-being, but it is actually increasing our already high traffic accident rate.

Figures compiled by the American Road Builders' Association show that Saturday has become the leading "danger" day on highways. In 1946, forty percent more people were killed in automobile mishaps on Saturday than on an average day. The total Saturday death toll was 6850, or more than one-fifth of all highway fatalities. The number of persons injured in motor-vehicle accidents on Saturdays rose by 25 percent to 231,760. In prewar years, most accidents and most casualties occurred on Sundays, but the "day of rest" has now taken second place. The obvious reason is that many people who once worked on Saturdays are now on the roads going somewhere, and often in a hurry.

Saturdays and Sundays together account for two-fifths of the highway fatalities and more than one-third of the injuries. The death toll continues to mount despite better-built, safer roads, principally because people drive more than they used to. Twenty years ago the per capita travel of adults by all means of transportation was 450 miles annually. Now it is 4000 miles by cars alone. Meanwhile, the number of automobiles is steadily increasing, and it is predicted that by the end of this year it will exceed the 1941 total of 34,472,145 vehicles.

Hot-Cold Tube Phenomenon Explained

IN OUR May issue (page 131) we printed the picture that is reproduced here in smaller size and reported that research engineers were puzzled by the fact that a tube as shown will produce both hot and cold air when compressed air is introduced into one end of it—the hot air issuing from the pipe at the periphery and the cold air in the center being drawn off through a small opening. It is really an old trick that should not fool anyone versed in the laws of thermodynamics, according to P. A. Baumeister, a Flushing, N. Y., veteran pneumatic engineer whose explanation follows:

EDITOR— This seeming mystery is no more one than a gas fired refrigerator, where a tiny flame of gas turns out ice cubes or cold beer on the other end of the line. Evidently the problem has fallen into the hands of someone who is unfamiliar with the basic laws of thermodynamics.

When air is expanded from a higher to a lower pressure there is a drop in temperature because static pressure energy is converted to kinetic or velocity energy. This change requires the use of heat, which in this case is taken from the air itself. Any textbook on thermodynamics gives the laws of adiabatic expansion. The approach to these laws for perfect gases depends on the design of the equipment used. A well designed orifice will have a coefficient of 98 to 99 percent, whereas a rough hole may have only a 40 to 50 percent coefficient.

In the apparatus in question there is some kind of a nozzle or orifice, and the air acquires velocity with a consequent drop in temperature. If the air that has been given velocity is brought to rest, it requires as much work to stop it as it did to accelerate it, and this work appears as heat. The temperature would ultimately reach the same degree as existed before the expansion took place.

In the experiments reported, the low temperatures were evidently read in a stream of air having high velocity, such as would exist where air is admitted at one end of a tube and removed at the other end. In addition, the air was admitted so as to give it a whirling motion. The layer of air near the surface would experience skin friction through its contact with the wall of the pipe. The friction would heat the adjacent layer of air and the heat would be augmented by eddy currents and also by warmth absorbed from the atmosphere.

It so happens that this particular apparatus acts as a crude centrifuge that separates two masses of air, one of which is colder than the other. If the air were all taken out at one end, the exit temperature would be a weighted average between the high and low figures reported.

As the thickness of the layer of air affected by being in contact with the wall of the pipe would be approximately the same for a small or a large diameter pipe, it is to be expected that a small pipe would produce a greater temperature differential because the relative volume of the air near the pipe wall to the total volume in the pipe would be many times greater than in the case of a larger pipe.

NO MYSTERY HERE

Actually the whole experiment is just a variation of a principle discovered many years ago and utilized in the liquefaction of gases. Anybody interested can become informed by reading up the so-called Joule effect, named after one of the pioneers in low temperature refrigeration.

The experimenters are quite correct in their deduction that there will be very little practical use of their rediscovery, as the employment of air as a refrigerating medium, even with the most efficient cycles and equipment, is virtually a dead issue.

33-57 162nd St.,
Flushing, N. Y. —P. A. BAUMEISTER

COINING OIL GROOVES

Westinghouse Electric Corporation uses this air-operated fixture at Lima, Ohio, to impress oil grooves in small shaft journals. When inserted in the fixture, the shaft rests on two heavy-duty roller bearings placed side by side. Mounted on a slide above the bearings is a ribbed die which has an angular rib on its face that corresponds to the journal diameter and pitch and which is actuated by the air cylinder shown at the left. The fixture can be adjusted to take shafts with journal diameters from ½ to 1 inch, and the depth of the groove also can be varied. Journals can be grooved in a small fraction of the time required by milling, and the job done is better because the side walls of the grooves are as smooth as the polished rib on the die.

Improved Iron-Ore Concentrator

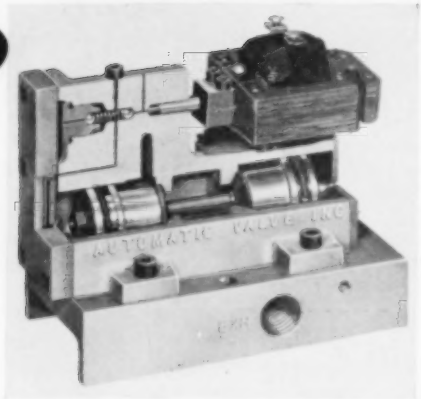
A NEW washing-tower method of concentrating low-grade iron ore not only doubles the ore concentration but recovers more than 90 percent of the iron content, according to a report now on sale by the Office of Technical Services of the Department of Commerce. The process, developed in Germany, was investigated and reported upon by J.V.N. Dorr, president of the Dorr Company, New York City, aided by two members of his organization, A.J. Fischer and F. B. Hardon.

The Wiedelmann washing tower, as it is known, replaces the older method of dressing low-grade iron ore by screening, roll-crushing, washing, and finally elevating it to cylindrical screens, and is especially adapted for treating ores containing clay or other materials that can be readily suspended in water. It is a large cylindrical concrete tank with a hopper bottom. Running down the center is an air-lift pipe that extends above the tower top to a horizontal screen. A charge of ore of 0-50 mm. (1.96 inch) fineness is fed through an opening in the tower top and stirred by circulating water and air for 24 hours. The water overflow carries off fine clay in suspension, while the heavier iron ore sinks. Compressed air is then admitted to the tower bottom so as to blow the washed ore upward into and out of the air-lift pipe to the horizontal screen, where it is washed again for 20 minutes, meanwhile being mechanically agitated. Screen undersize (0-8 mm. or 0.31 inch) and oversize (more than 8 mm.) are collected separately, drained, and shipped to blast furnaces.

In a test run, the Germans obtained a recovery of 91.6 percent of the iron-ore content, with an increase in iron-ore concentration ranging from 21.6 percent in the raw material to 38.9 percent in the washed product. Wiedelmann, the inventor, claims that ores treated by his process requires less lime in the blast furnace than do ores washed by methods that remove a large proportion of the lime content. It is stated that the tower is less expensive to install and maintain than conventional plants. Operating costs are about the same for both.

Frank D. Lamb, chief of the mineral-dressing unit of the U.S. Bureau of Mines Experiment Station, College Park, Md., calls the tower an interesting new application of the gravity-separation principle long used in this country. He believes it can be utilized in Minnesota, Pennsylvania, Tennessee, Alabama, Texas, and other regions where lean ores are commonly concentrated by the gravity method. Comparative costs between it and existing practices cannot be determined until test runs of American ores have been made in the tower.

Industrial Notes

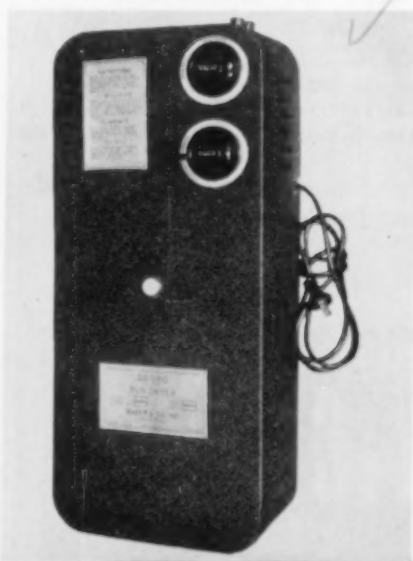


Shown in the accompanying picture is a new 3-way, 3-port solenoid air valve developed by Automatic Valve, Inc., for the control of single-acting pneumatic cylinders that operate machine tools. Known as the SV-3, it is said to be compact and light, permitting it to be attached close to a cylinder and to eliminate lengthy piping and air wastage. Mounted in any position, it can be serviced without disturbing piping. Normally open or closed, it is a balanced piston-type valve that is pressure-sealed and reversible in assembly. There are no metal contacts because of the use of special ring seals. The SV-3 is available in ¼-, ⅜-, ½-, and ¾-inch sizes using air at pressures ranging from 5 to 150 psi. Solenoids are the same as those embodied in all Automatic type valves.

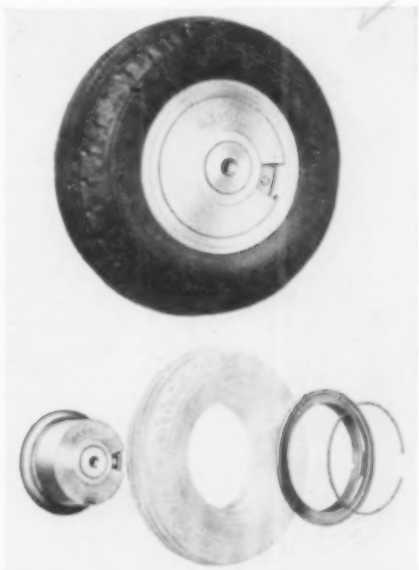
Drop-bottom skid boxes, originally built by Monroe Auto Equipment Company for handling small parts in its own plants, have been put on the market by that concern. The containers are constructed of corrugated hot-rolled steel, and the hinged bottom is supported by two heavy removable pins. There are six sizes with dimensions ranging from 24x36x24 inches to 42x60x30 inches, underclearances from 7½ to 12 inches, and capacities of 1500 to 4000 pounds. They may be used with ordinary lift trucks, and company offers separate stands to hold the boxes 41 inches above floor level and to serve as work benches after loads have been dumped on them. Records of performances of 200 of these skid boxes in several of the company's factories show savings in materials-handling costs of 20 percent and more.

Whether they crawl or fly, or nest in hard-to-reach places, insects destructive to foods or fabrics can be destroyed wholesale, it is claimed, by an atomizer developed by West Company. A permanent installation for industrial purposes, the unit is air controlled and dispenses a concentrated, odorless insecticide known as Vaposector that is not injurious to workers or product. A turn of the compressed-air valve sends out a fog that does its lethal work as well in a large as in a confined space, says the manufacturer.

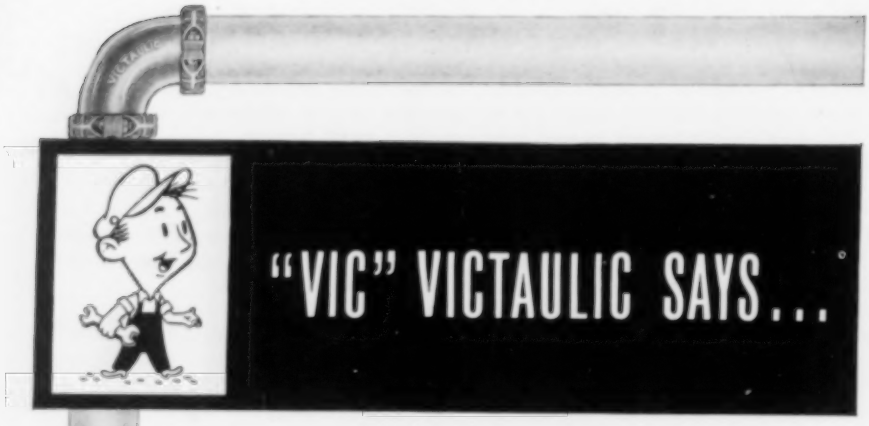
To meet the industrial need of moisture-free gases of high purity, Baker Company, Inc., has developed an instrument that works automatically. Known as the Deoxo Puridryer, it will treat gases such as hydrogen, nitrogen, argon, neon, and saturated hydrocarbons. Installed at any convenient point in a low-pressure line, it is said to deliver hydrogen, for example, in which remains less than one part in a million parts of oxygen impurities and which has been reduced to a dew point of better than −50°F. by passage through an integral drier. The unit is encased in a housing provided with two operating dials and a green pilot light, and its capacity depends upon the moisture content and the impurity of the incoming gas. Using a bottle of hydrogen of 99.7 percent purity, and with a maximum flow rate of 50 cfh., pure gas of the aforementioned dew point will be supplied continuously for more than 36 hours without reactivating the drying element. This is done by turning first the upper dial, which cuts off the incoming gas, and then the second one, which starts the reactivating timing cycle, heats the drying chamber, and allows a small quantity of gas to pass through it. This purging gas becomes saturated with moisture and then flows through a special converter to extract the water vapor and exhaust it to atmosphere. When this operation is completed, the green light again glows to indicate the instrument is ready for service. The catalyst used in the purification phase does not require reactivation. It will last indefinitely unless poisoned by sulphur compounds, carbon monoxide, or some organic-solvent vapors, which are rarely found in commercial hydrogen. The Deoxo Puridryer is recommended for atmosphere furnace application and for service in such fields as powder metallurgy, brazing, heat treating, food processing, hydrogenation, etc.



According to a recent announcement of the Aerol Company, its new-type pneumatic wheel with detachable rim for small industrial trucks makes it possible to change a tire in less than a minute. The wheel, cast of aluminum alloy, is in two sections: the main body, including one rim, and the detachable rim which is held by a special steel-spring retainer ring. Work is done with wheel in normal position and without tools, as follows: Tube, with just enough air in it to round it out, goes into tire, which is then mounted on wheel; detachable rim is pushed with fingers towards other rim; lock ring is put in place; and tire is fully inflated. Removal is effected by deflating tire, pressing detachable rim toward fixed rim until retainer ring is exposed for withdrawal, and slipping off detachable rim and tire. For lightness, strength, and durability, Aerol wheels, identified as Model PW-1642, are of double-wall construction and are provided with factory-lubricated tapered roller bearings. They are in production in three axle sizes—1¼-, 1-, and ¾-inch—and are sold nationally through jobbers and dealers.



With a Puncture Policeman, we are informed, you can locate wire, tacks, nails, and bits of metal that your tires may pick up. Checking is done by mag-



"VIC" VICTAULIC SAYS...

"Our Couplings Save Money for Others ...Why Not for You?"

"Just a couple of twists with *any* type of wrench ... and the two bolts on Victaulic Couplings are buttoned up! That's the 'two-bolt' simplicity that saves you *time and money* in assembly ... repair ... salvage!

"Then too, Victaulic Couplings give your piping systems a *flexibility* that lets the line follow building and ground contours *without the expense of rigid alignment!*

"What's more, when you use Victaulic Couplings your piping systems have a *union at every joint* ... with a slip-proof lock that can't blow off or pull out under pressure, vibration or sag ... and contraction-expansion is taken care of *automatically!*

"Now, to wind up this economy-picture, take a look at Victaulic FITTINGS. Their long and easy sweeps have been engineered for FULL-FLOW service ... internal friction is reduced to a minimum. You get increased delivery at lower pumping costs ... with VICTAULIC FULL-FLOW FITTINGS!

"Yes sir! For the extra economy of *full* efficiency and *complete* dependability ... make your next piping system ALL Victaulic!"

Write for new Victaulic Catalog and Engineering Manual

VICTAULIC COMPANY OF AMERICA

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Victaulic, Inc., 727 W. 7th St., Los Angeles 14, Calif.

Victaulic Company of Canada, Ltd., 200 Bay St., Toronto 1

For export outside U. S. and Canada: PIPECO Couplings and Fittings: Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

Have you considered Victaulic for your piping requirements?

Sizes — ¾" through 60"

SELF-ALIGNING PIPE COUPLINGS

VICTAULIC

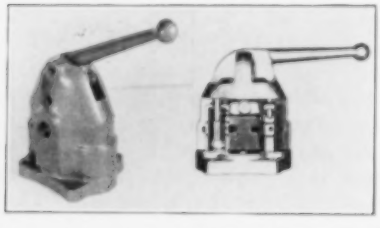
EFFICIENT FULL-FLOW FITTINGS

Copyright 1947, by Victaulic Co. of America

net-operated signal lights with the tires in place and makes it possible to remove sharp objects in time to prevent punctures. Battery and 110-volt models are distributed by Modern Merchandisers, Inc., Chicago 4, Ill.

All stoper drills used by Wright-Hargreaves Mines in its workings have been provided with a handle guard made of lightweight steel covered with rubber belting. It is shaped to fit over the hand with plenty of clearance and protects it from rock that may fall when starting a hole.

Designed on the balanced-piston principle, the new line of Lindberg Engineering Company 4-way air valves eliminates linkages or mechanical connections between pistons and operating levers of machines. Piston is held in place by air pressure, and 3-position lever permits setting valve in forward, neutral, or reverse. Cylinder can be stopped at any



point along the stroke by placing lever in neutral. Valves are made of cast aluminum with inner parts of stainless steel and bronze and are built for a maximum working pressure of 175 psi.

For men traveling or working remote from approved sources of drinking water, Wallace & Tiernan, Belleville, N. J., has devised a portable kit that weighs less than 5 pounds. It includes hose, a hand pump, filter, and purifying tablets (Aqua-Tabs). Known as Mini-Filter, the unit operates on the same principle as municipal water works.

Papermakers' felts are being treated by a process that was originally developed by Orr Blanket Company to make woolen fabrics washable. When it was discovered that it also made the materials more resistant to abrasion, it was tried out on felts with highly satisfactory results. According to the textile-resin department of the American Cyanamid Company, the felts are processed with Lanaset, a melamine compound, and tests in mills making varying grades of paper, paperboard, etc., have proved that the treated felts last more than twice as long as those now in common use. Aside from the need of fewer felts, machines have to be shut down less frequently to make replacements, and this we are told results in an increase in production of as much as 15 percent. The new product is now on the market.

It soaked up the shock of 10 million crashing tons

A typical example of B. F. Goodrich product development

IT WAS only a 390 foot haul — but it proved to be a costly one. Huge hunks of coal had to be carried from a railroad siding to a barge dock on the river bank below. A belt conveyor system was the obvious answer. So one was built and put into service.

Everything was fine—until the belt wore out before it had carried 4 million tons. Now that much coal will heat a lot of houses. But it wasn't enough to make the belt a good investment. The second belt was even worse —just over 3 million. And the third one, which went 5½ million tons, still added too much to the cost of the coal.

Then the coal company—and the mining industry—got a break. B.F. Goodrich belting engineers developed a new kind of belt in which hundreds of individual cords—each completely embedded in rubber — replaced the usual stiff fabric "carcass." They added a top ply with the cords running across the belt. When heavy hunks of material hit the belt it "gives" in both directions—absorbs the shock instead of fighting it. One of these cord belts was installed to carry the coal to the barge dock. Up to now it has handled *over 10 million tons and is still in service.*

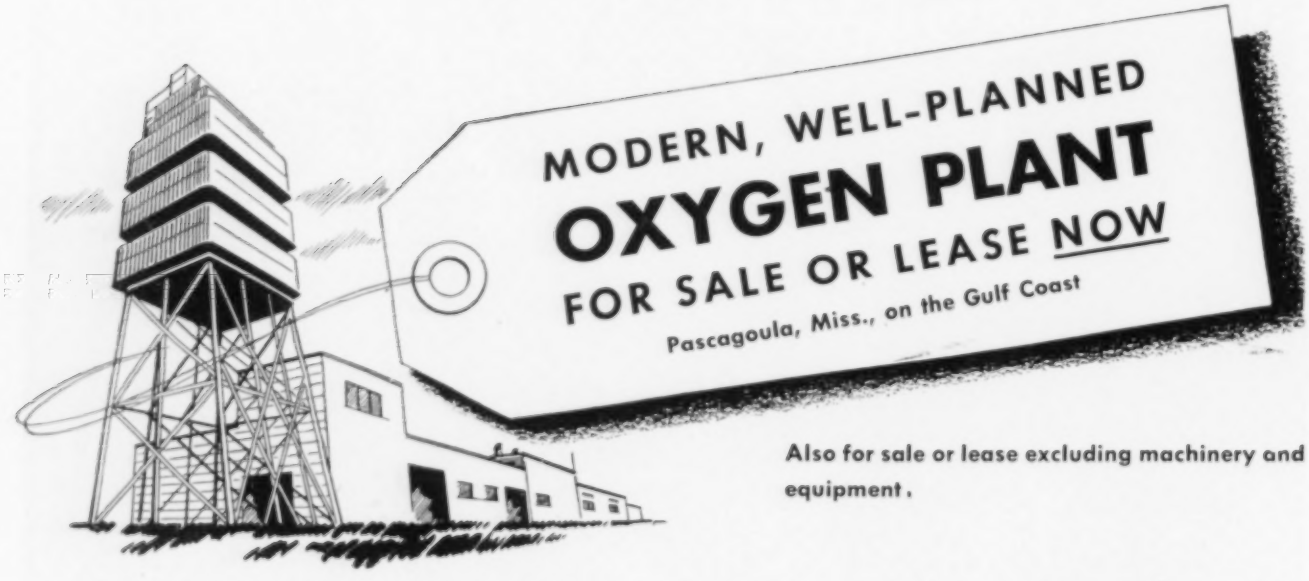
No one knows yet just how much the cord belt will reduce handling costs for this company. But there are records of other cord belts which have lasted *10 times as long* as conventional belts—each one a typical example of the results of B.F.Goodrich research and product development. *The B.F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F.Goodrich

FIRST IN RUBBER

MAKE OXYGEN HERE

for the Southern Trade



Also for sale or lease excluding machinery and equipment.

Serve the South's industrial oxygen users, at close range, more promptly, more efficiently. On-the-spot oxygen production, in the heart of the market you serve, can mean reduced transportation-handling costs, a more accurate cylinder inventory control, a more profitable business for you.

Oxygen manufacturers—buy or lease this ready-to-produce oxygen plant at Pascagoula, Mississippi, on the Gulf Coast.

LOCATION: Site, about 1½ acres, is on the main line of the Louisville and Nashville Railroad about 60 miles from Mobile, Alabama. U. S. Highway 90 passes the plant, dock facilities (of others) are about 500 ft. from site.

MACHINERY AND EQUIPMENT: The offer to sell or lease, as a complete unit, includes production equipment: two oxygen fractionating columns, each rated at 100,000 cu. ft. per day; one oxygen dryer unit; a soda tower unit; pumps; a wood cooling tower; a balloon oxygen storage unit; air compressor; a trailer and cylinder filling unit; 156 cylinders, 9⅜ inches by 20½ ft.; and office furniture and fixture items.

BUILDINGS: A one-story main building with monitors over the soda tower and engine room, 65′ x 135′; concrete foundations with wood siding on wood frame throughout, concrete floor, floor area about 8,600 sq. ft., clearances 10 to 34 ft. Minor structures, a 12′x12′ Hotwell pumphouse, cooling towers, substation and a 16′ x 11′ Flowmaster control house.

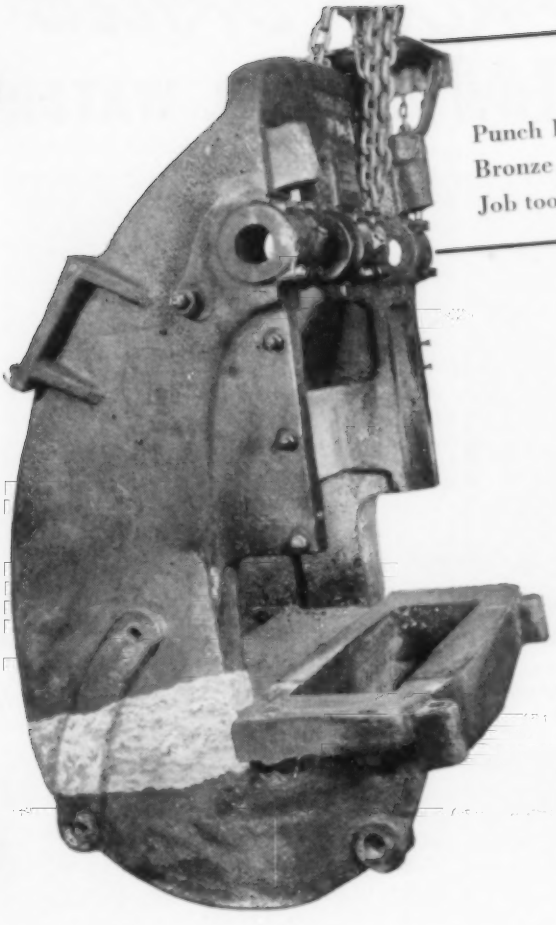
SEALED BIDS: Your sealed proposals, on Standard Bid Forms, will be received by War Assets Administration, Office of Real Property Disposal, 7020 Franklin Avenue, Station D, New Orleans 17, Louisiana, until 3:00 P.M., C.S.T., September 8, 1947, at which time and place all proposals will be publicly opened and read. Qualifying small business may purchase through RFC.

DESCRIPTIVE BROCHURE: For a detailed property description write:

WAR ASSETS ADMINISTRATION
OFFICE OF REAL PROPERTY DISPOSAL

7020 FRANKLIN AVENUE • STATION D • NEW ORLEANS 17, LOUISIANA

1306



REPAIRED

Punch Press frame repair-welded with 52 lb. of 3/8" Tobin Bronze by the Sutton-Garten Company, Indianapolis, Ind. Job took one day for preparation and one day for welding.

RECONDITIONED

This group of worn and broken gears from wire braiding machines was quickly and economically reconditioned with Tobin Bronze Welding Rod.

...by TOBIN BRONZE WELDING

Almost any piece of equipment made of cast iron, malleable iron, steel or copper alloys can be quickly and economically repaired by oxy-acetylene welding with Tobin* Bronze.

Because of the low temperature used when welding with bronze, no serious stresses are set up, there is less chance of warping or cracking and parts can often be welded without dismantling equipment.

For years, this method of bronze welding has been used for reclaiming broken, fractured or worn equipment, or for building up bearing surfaces—at a fraction of the cost of replacement parts.

Write for Publication B-13, containing detailed information on Anaconda Welding Rods, including Tobin Bronze and "997" (Low Fuming). 47171A

*Reg. U. S. Pat. Off.

ANACONDA
from mine to customer

Anaconda
WELDING RODS

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: Anaconda American Brass Ltd.
New Toronto, Ont.

TODAY, THE ROAR OF ROCK DRILLS

TOMORROW, THE STEADY FLOW OF COOL WATER

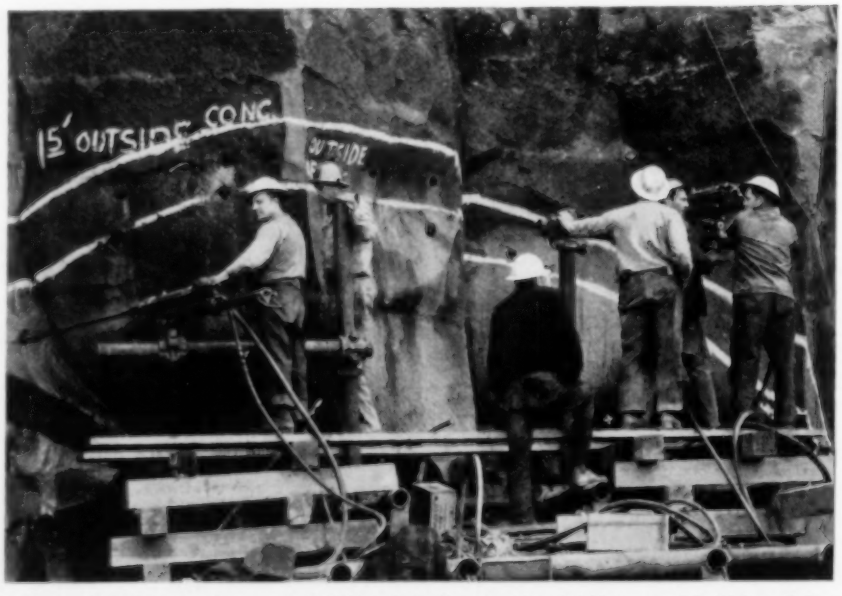
Both wagon drills and jackhammers are on the job near Coulee Dam to clear the way for the gigantic feeder canal. Bethlehem Hollow is slugging it out with tough granite on this location. *Bureau of Reclamation photo.*

These canals and tunnels in the making, part of the Columbia Basin Irrigation Project, soon will carry cool, life-giving water to some 1,029,000 arid acres in the eastern section of the State of Washington.

The long trip south will begin with the pumping of water from the Grand Coulee Dam, thence through the feeder canal to the equalizing reservoir. From there the water will flow through a 1,000-ft concrete siphon and the Bacon Tunnel, nearly two miles in length, to the Long Lake Reservoir, which will feed into broad canals traversing potentially rich farmlands.

The rock excavation involved in this vast undertaking is proceeding at a rapid pace. At both faces of the Bacon Tunnel, at the feeder canal, and at other sites Bethlehem Hollow Drill Steel is speeding the boring of hard rock.

Bethlehem Hollow is the kind of drill steel that the contractors and drill runners prefer. It's tough, fatigue-resisting, and reliable. Blacksmiths depend on it because it forges readily to close dimensions and has a wide quenching range. Whether used for forged-on or detachable bits, there's no better steel for hard-rock drilling.



The Bacon Tunnel, in this first round of drilling, is feeling the bite of 1 ¼-in. round Bethlehem Hollow Drill Steel with forged-on bits. The tunnel will be nearly 2 miles in length, 23 ft in diameter. T. E. Connolly, Inc., is the contractor. *Bureau of Reclamation photo.*

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

BETHLEHEM HOLLOW DRILL STEEL

Easier way to better piping
...CRANE Supplies Everything

Why do it the hard way when you can simplify every step of piping jobs—from design to erection to maintenance work. Specify Crane equipment—the truly complete line that not only includes everything you need, but assures the quality you want in every item.

This air service piping system, for example, shows the 3-way advantage of standardizing on the complete Crane line—

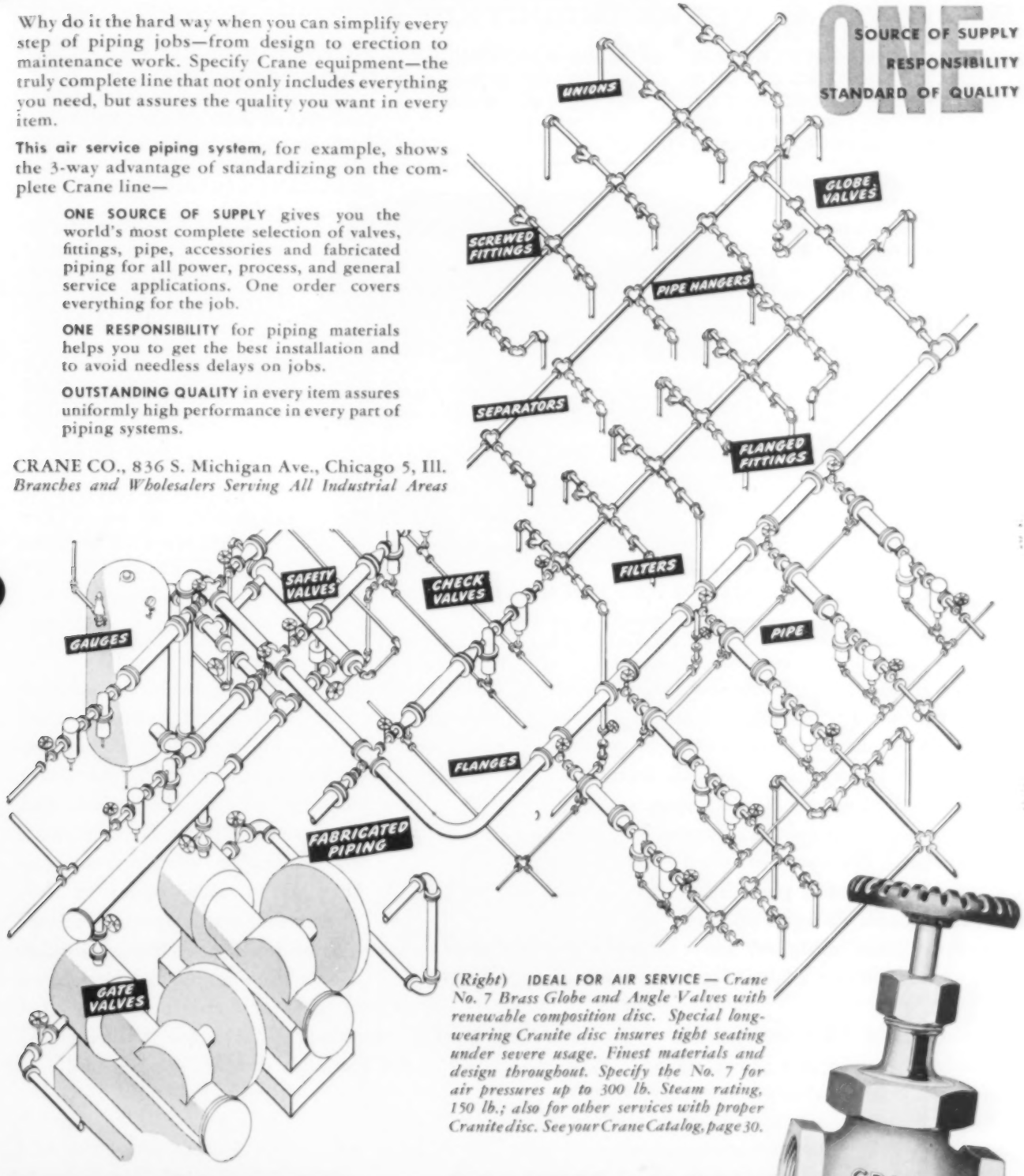
ONE SOURCE OF SUPPLY gives you the world's most complete selection of valves, fittings, pipe, accessories and fabricated piping for all power, process, and general service applications. One order covers everything for the job.

ONE RESPONSIBILITY for piping materials helps you to get the best installation and to avoid needless delays on jobs.

OUTSTANDING QUALITY in every item assures uniformly high performance in every part of piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



(Right) **IDEAL FOR AIR SERVICE** — *Crane No. 7 Brass Globe and Angle Valves with renewable composition disc. Special long-wearing Cranite disc insures tight seating under severe usage. Finest materials and design throughout. Specify the No. 7 for air pressures up to 300 lb. Steam rating, 150 lb.; also for other services with proper Cranite disc. See your Crane Catalog, page 30.*

EVERYTHING FROM . . .

VALVES - FITTINGS
PIPE - PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

BURKE'S *New Induction Motor*

RESULT OF 41 YEARS INDUCTION MOTOR EXPERIENCE

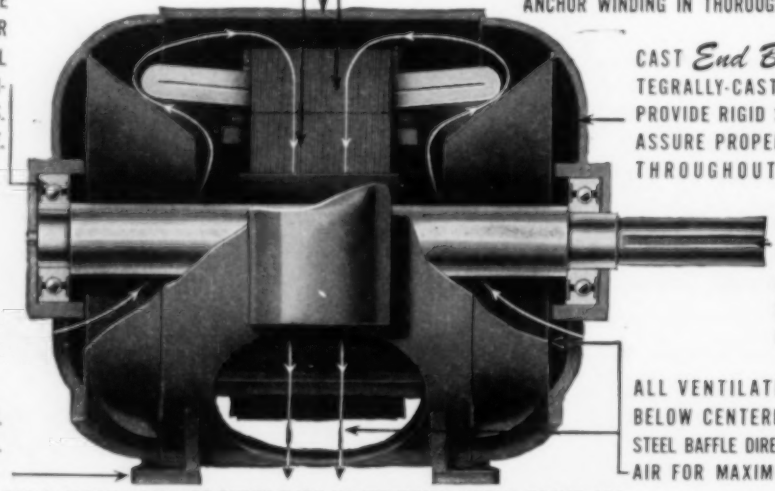
Rotor LAMINATIONS OF HIGH GRADE ELECTRICAL SHEET STEEL, SECURELY KEYED TO SHAFT SPIDER. ROTOR BARS OF HARD DRAWN COPPER STRIP FIRMLY EMBEDDED IN PARTIALLY CLOSED ROTOR SLOTS. EXTENSION OF ROTOR BARS PROVIDES AMPLE FAN ACTION FOR EFFICIENT VENTILATION.

Frame OF ROLLED, WELDED STEEL FOR GREATEST RIGIDITY WITH MINIMUM BULK AND WEIGHT.

Stator CORE, OF HIGH GRADE ELECTRICAL SHEET STEEL, IS INDEPENDENT OF SUPPORTING FRAME; AND RIGIDLY WELDED INTO PLACE TO MAINTAIN PERFECT ALIGNMENT. STATOR COILS ARE WOUND WITH NEW SYNTHETIC RESIN-COVERED WIRE PROVIDING EXCELLENT DIELECTRIC STRENGTH AND MAXIMUM EFFICIENCY. FIBRE WEDGES SECURELY ANCHOR WINDING IN THOROUGHLY INSULATED SLOTS.

Ball Bearings ARE OF DOUBLE SEAL, PRE-LUBRICATED TYPE. NO FURTHER LUBRICATION NECESSARY DURING NORMAL LIFE OF MOTOR. PRESS FIT ON SHAFT ELIMINATES NEED OF LOCK NUTS AND WASHERS. SLEEVE BEARINGS ALSO AVAILABLE.

HEAVY, CROSS-WELDED, FORMED STEEL FEET PROVIDE FIRM MOUNTING SUPPORT.



CAST *End Brackets* WITH INTEGRALLY-CAST BEARING HOUSINGS PROVIDE RIGID SUPPORT FOR ROTOR, ASSURE PROPER SHAFT ALIGNMENT THROUGHOUT LIFE OF MOTOR.

COMPLETE ROTOR IS DYNAMICALLY BALANCED AFTER ASSEMBLY TO GUARANTEE SMOOTH, QUIET OPERATION.

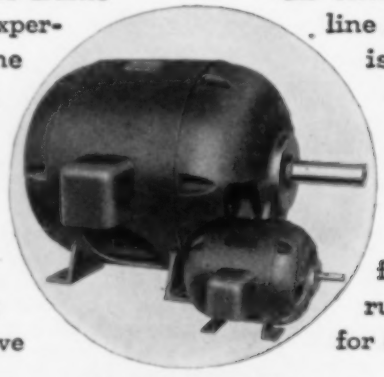
ALL VENTILATING OPENINGS ARE BELOW CENTERLINE. STURDY SHEET STEEL BAFFLE DIRECTS FLOW OF INCOMING AIR FOR MAXIMUM COOLING EFFECT.

CROSS SECTION VIEW OF BURKE TYPE NB INDUCTION MOTOR, FRAME 404

Burke Series "D" NEMA Frame Sizes 203 to 505.

Burke's new line of Drip-Proof Induction Motors follows our traditional policy of designing to generous proportions. We have achieved the utmost from NEMA frame standards utilizing over 30 years experience with welded steel plate frame construction. We have not tried to confine component parts into minimum space. As in all Burke motors we have designed for a generous factor of safety.

These Series "D" Motors on exhaustive tests in our plant have fully justified our generous-proportion-theory—they run exceptionally cool over extended periods of service. Note above that cooling air enters at each end below the centerline induced by rotor fan action, and is deflected up and down and around motor windings leaving thru large side openings between feet and below the centerline—no chance for recirculation. Here ample interior space for air-flow contributes to cool running. Write for bulletin D-1 for complete data.



Uniform in design from NEMA frame sizes 203 to 505.

BURKE ELECTRIC COMPANY 2078 W. 12th ST. ERIE, PA.

UNIVERSAL MOTORS 1 50th to 1½ HP

SINGLE PHASE MOTORS to ½ HP

INDUCTION MOTORS 1 to 1500 HP

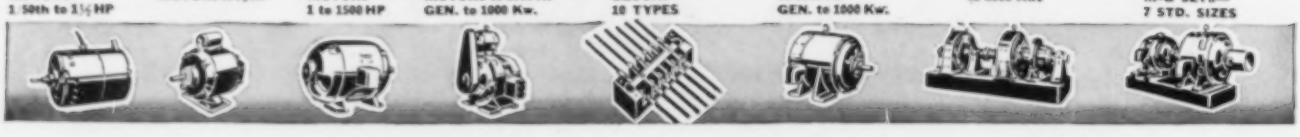
SYNCHRONOUS MOTORS to 1500 HP GEN. to 1000 Kw.

TERMINAL BLOCKS 10 TYPES

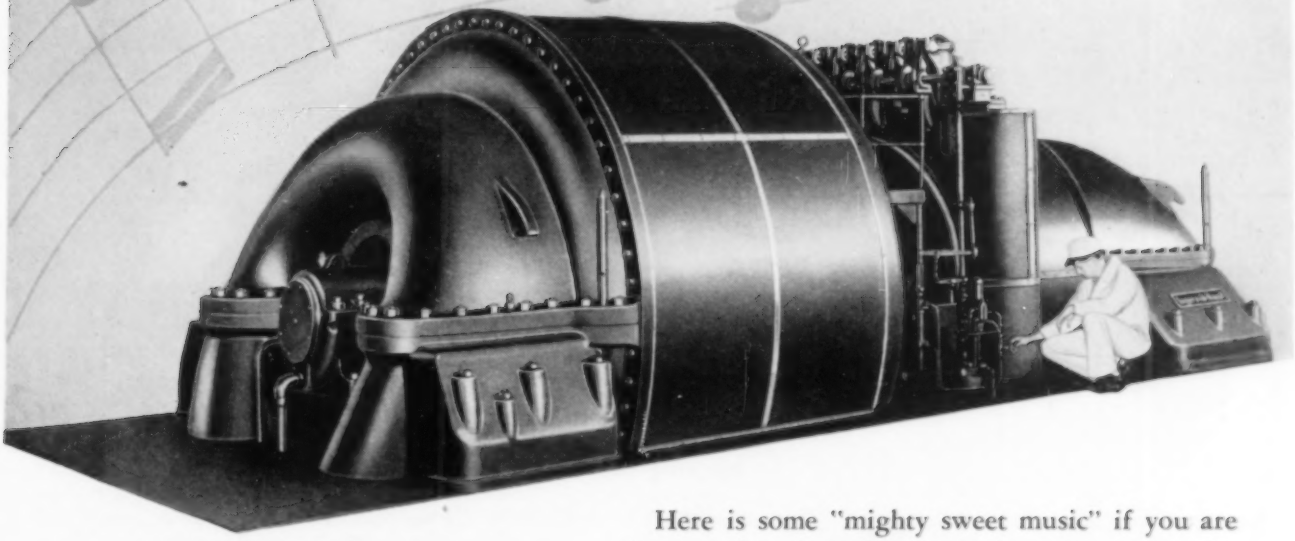
D.C. MOTORS to 1500 HP GEN. to 1000 Kw.

M-G SETS to 1000 Kw.

HIGH CYCLE M-G SETS— 7 STD. SIZES



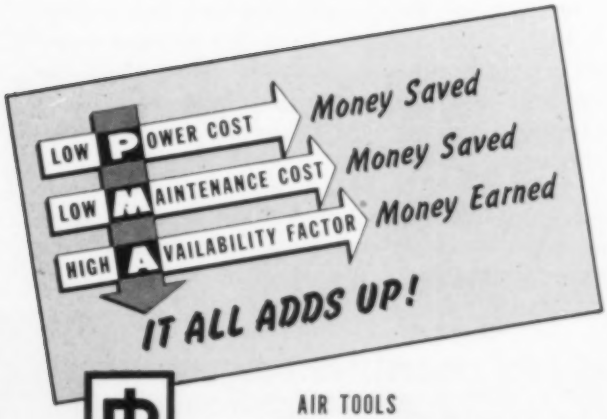
A Blower Record that "Plays Your Tune"



Here is some "mighty sweet music" if you are interested in lowering operating costs and maintaining production.

One of our 11,000 hp turbo-blowers was recently opened for inspection after six years of continuous service...and it was in *perfect* condition! This means that the original low Power consumption was not affected by use—Maintenance cost was nil —Availability was 100%.

Although we don't approve of neglecting the recommended annual inspection, this blower gave the peak performance demanded during the war and set a P-M-A record that is really something to sing about.

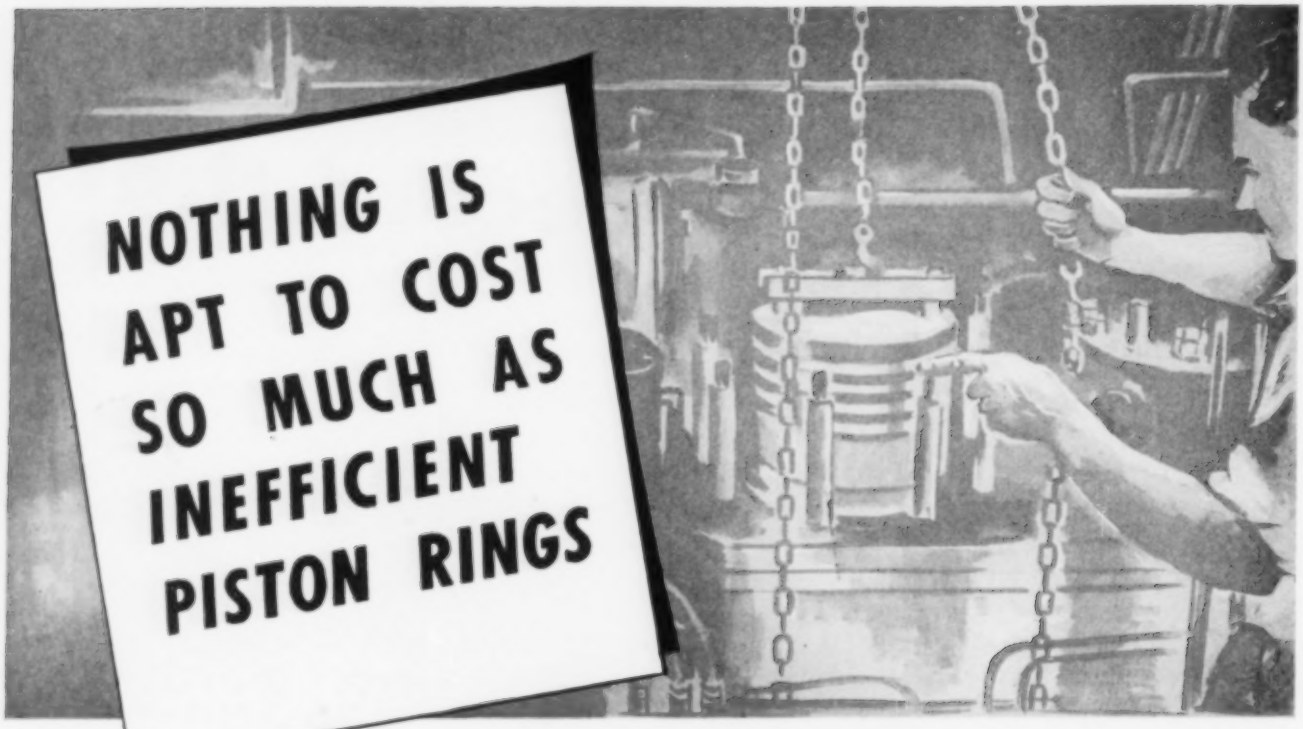


AIR TOOLS
COMPRESSORS
OIL AND GAS ENGINES
CONDENSERS • CENTRIFUGAL PUMPS

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

12-885



...take "RING LIFE"

Cook Graphitic Iron Plain Rings feature: Excess carbon in the form of graphite flakes to ease the ring over dry spots in the cylinder—Porosity to facilitate spreading of lubrication—Rapid work-hardening ability to minimize friction, prolong life—Freedom from wear-inducing steel-like inclusions (carbides).

Ring Life depends largely on the ability of the ring material to withstand constant severe service without appreciable wear. Unless the ring material excels in wear-resisting properties, ring life is shortened and you add to your operation sheet many hidden items of cost in the form of higher fuel consumption—lost power—and loss of time and production due to frequent shutdowns for ring replacements.

You can eliminate these hidden taxes on economical operation by installing Cook Graphitic Iron Rings. Test after test both in laboratory and field have proved one indisputable fact. Cook Rings wear less and last longer. The secret is that Cook Graphitic Iron, the unique material of which Cook Rings are made, is unequalled for resisting wear and in helping the ring over periods of poor lubrication, overload, and extremes of temperatures and pressures.

And don't overlook the fact that these superior wear-resisting properties are obtained only in Cook Rings. If you want the complete story, WRITE TODAY—ATTENTION DEPT. 6-C.

C. LEE COOK MANUFACTURING CO.
INCORPORATED
LOUISVILLE, KY.

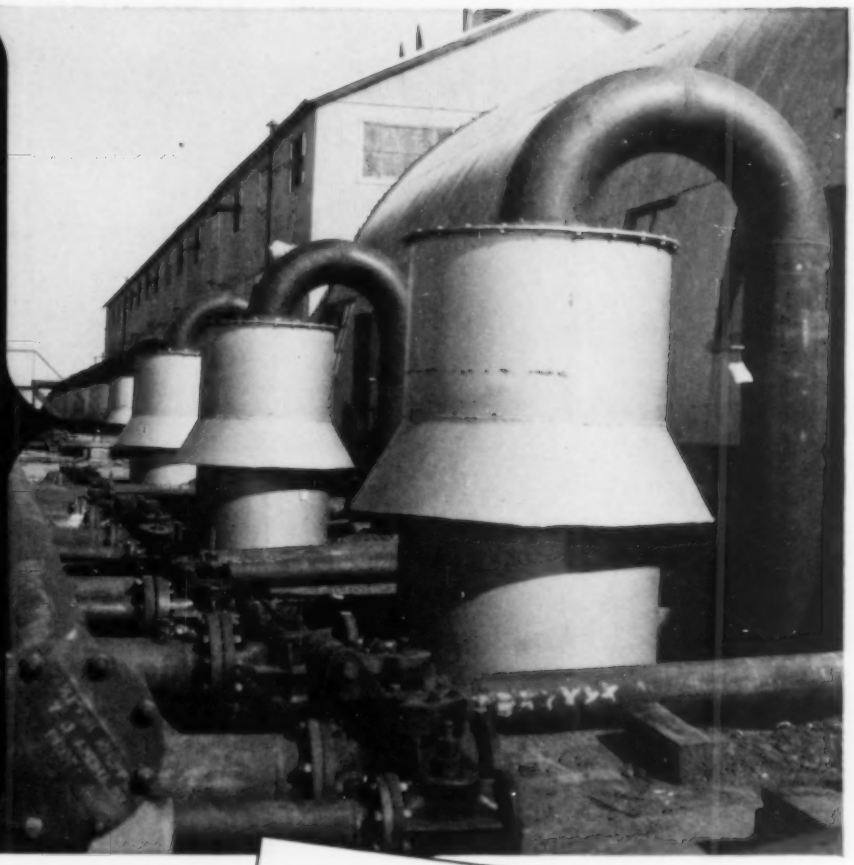
BALTIMORE • BOSTON • CHICAGO • CLEVELAND
HOUSTON • LOS ANGELES • MOBILE • NEW ORLEANS
NEW YORK • SAN FRANCISCO • TULSA

Sealing Pressures

Since 1888

"Better Piston Rings for Higher Efficiency—through Metallurgy"

Cycoil
the first line of defense against dust



DUST starts its attack on the "innards" of engines from the first day they go to work. The effects are slow but deadly, with costly shutdowns and repairs the eventual result. Wise operators set up their defenses against dust at the start in the form of Cycoil Oil Bath Air Cleaners.

Here is a heavy-duty air cleaner that's designed for real "dust bowl" service. Tests conducted in accordance with the A.S.H.V.E. test code show a cleaning efficiency for the Cycoil varying from 99.65% at 25% of its maximum capacity to 99.91% at full capacity. Operation of the Cycoil is unique in that 90% of the fine dust content of the air is trapped in oil and removed by centrifugal action before reaching the filtering element. Additional filtering action of filtering pads results in practically 100% efficiency in dust removal.

If you're interested in small investments that pay big dividends, you will want all the facts on the Cycoil Oil Bath Air Cleaner. Write today for copy of Bulletin 130-D.

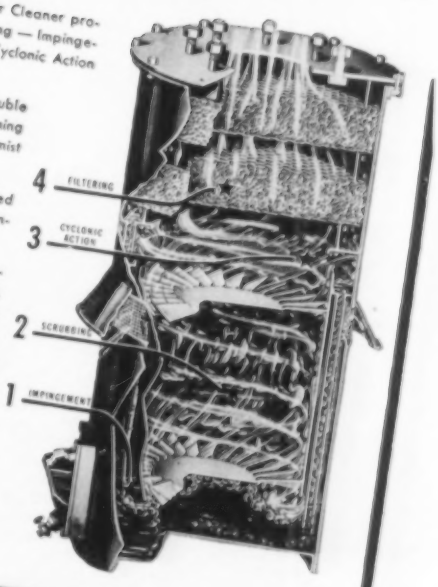
Cycoil Oil Bath Air Cleaner provides 4 way cleaning — Impingement, Scrubbing, Cyclonic Action and Filtering.

Filtration through Double Cells completes cleaning action eliminating oil mist from air.

Cyclonic action induced by vanes throws oil containing dust outward.

Scrubbing action, thoroughly mixes air and oil, entraining all dust particles.

Impingement of dirty air against oil, deposits the heavier dust particles immediately. Oil and air mixture then passes upward with whirling motion through vanes to succeeding cleaning steps.



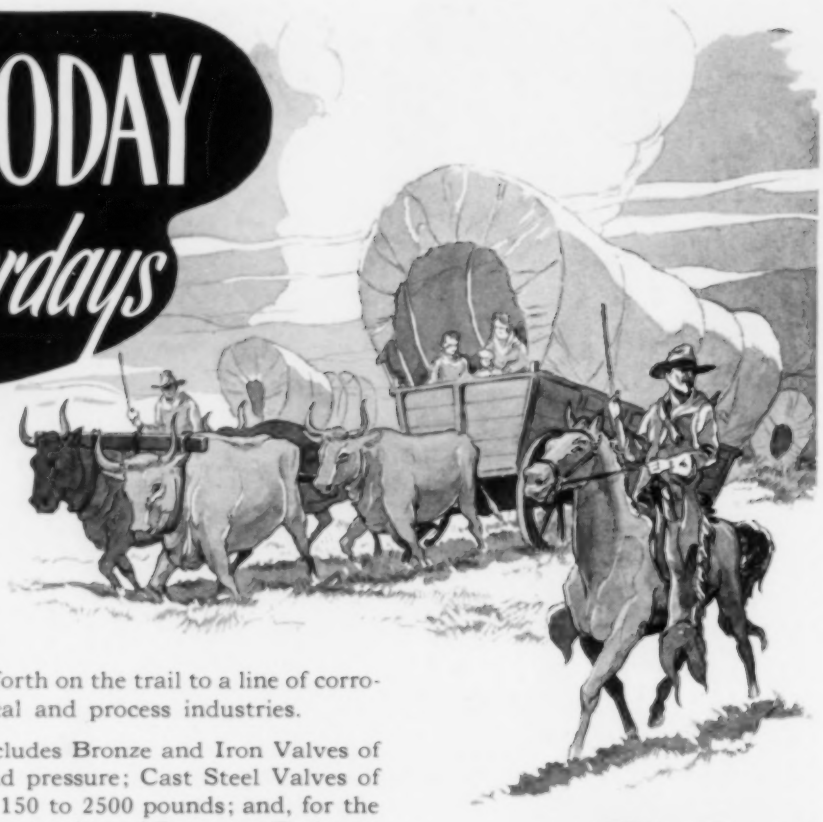
AMERICAN AIR FILTER COMPANY, INC.

402 CENTRAL AVE. • LOUISVILLE 8, KY.

In Canada: Darling Bros., Ltd. Montreal, P. Q.

AAF **Cycoil OIL BATH AIR CLEANER**
AND INTAKE SILENCER

PIONEERS TODAY *as in the yesterdays*



More than a century ago Powell started pioneering in the field of industrial valves.

The first bronze regrinding globe valve was a *Powell "first"*.

And, twenty-five years ago, with the establishment of the Special Design and Alloy Valve Division, Powell Pioneers were the first to set forth on the trail to a line of corrosion-resistant valves for the chemical and process industries.

Today the complete Powell Line includes Bronze and Iron Valves of every required type, design, size and pressure; Cast Steel Valves of every type, in pressure classes from 150 to 2500 pounds; and, for the chemical and process industries, a complete line of Corrosion-Resistant Valves in many special designs and the widest range of pure metals and alloys ever used in making valves.

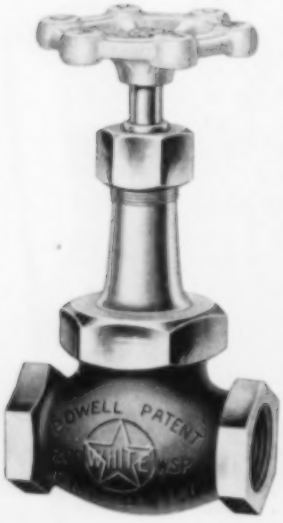


Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

Fig. 95—Bronze Dash Pot Check Valve for 200 pounds air working pressure. Designed for air compressor service. Has screwed ends, screwed cap, and regrindable, renewable, wear-resisting bronze disc. Because of the cushioning effect of the plunger in the dash pot, the seating of the disc is practically noiseless.

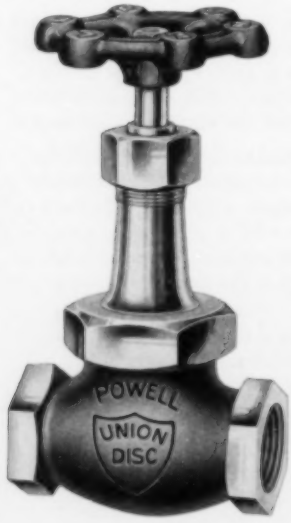


Fig. 150 — 150-pound Bronze Globe Valve with screwed ends, union bonnet and renewable composition disc.

Fig. 375 — 200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel bronze disc.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

Dependable

50 YEARS OF SERVICE TO INDUSTRY

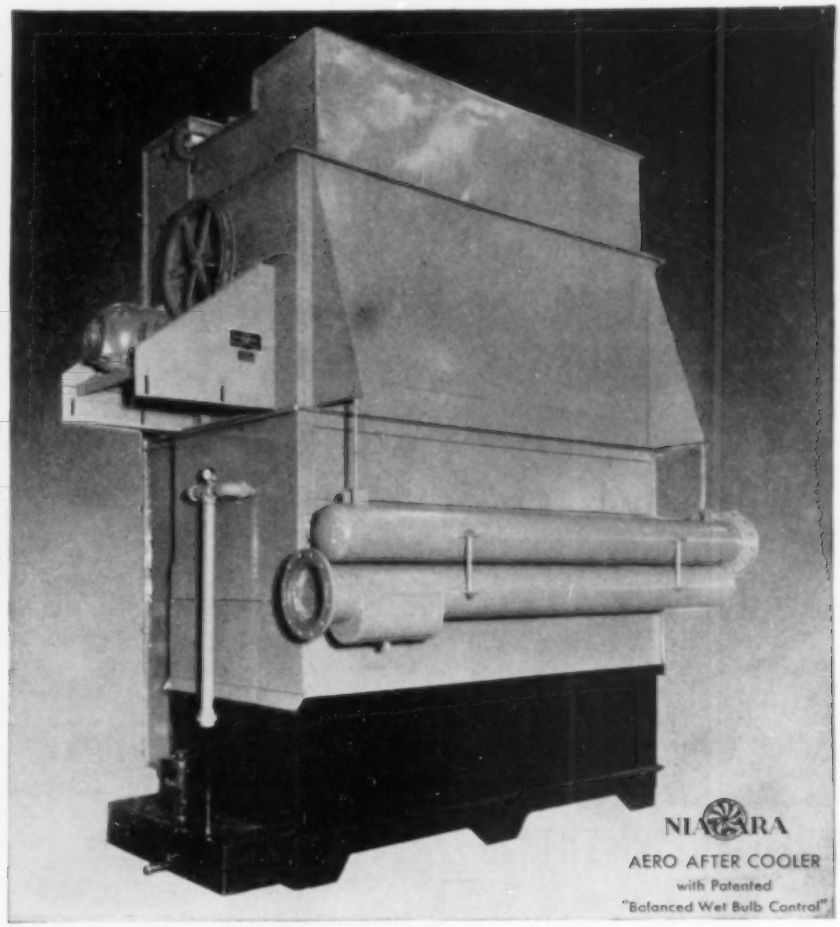
It's all in the Ring

Time tested France Rings are known the world over for their unique design. This design is the basis of the excelling performance of France Packing. France Rings in metal cases make a complete seal that compensates for rod deflection or misalignment. They save power and prevent costly shut-downs.

Write for Free Brochure "Industrial Packing"

Representatives In Principal Cities

FRANCE PACKING COMPANY
PHILADELPHIA 35, PA.



Save expensive "wear out" of air tools

● Water in compressed air lines is more than a nuisance; its cost is thousands of dollars yearly in worn-out tools and equipment, or broken air tools caused by water hammer, abrasion and washed-out lubricants.

Protect your air tools and compressed air processes with drier compressed air . . . using the NIAGARA AERO AFTER COOLER. Based on the evaporative cooling principle, it always keep the air in compressed air lines below the relative surrounding temperature, preventing condensation and, under the least favorable conditions, provides air with one-third to one-half the moisture content of water-cooled air.

Water savings will pay for the installation. Write for Bulletin 98-CA.

NIAGARA BLOWER COMPANY

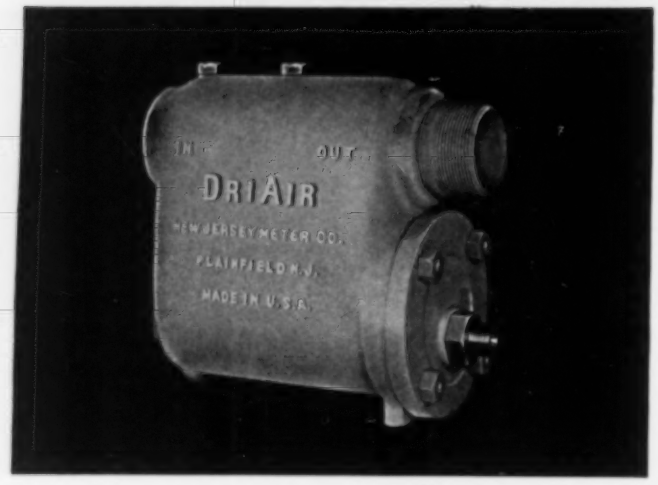
Over 30 Years of Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N. Y.

Field Engineering Offices in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING
NIAGARA
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

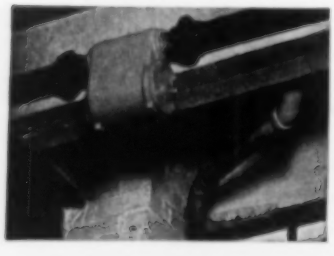
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper – resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

Send for this Bulletin

SQUARE D OFFERS

a wide range of automatic controls for practically all sizes of water pumps, condensate pumps, vacuum pumps, and air compressors. Send for your free copy of Bulletin 550, with illustrations and specifications. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

NORGREN LUBRICATORS

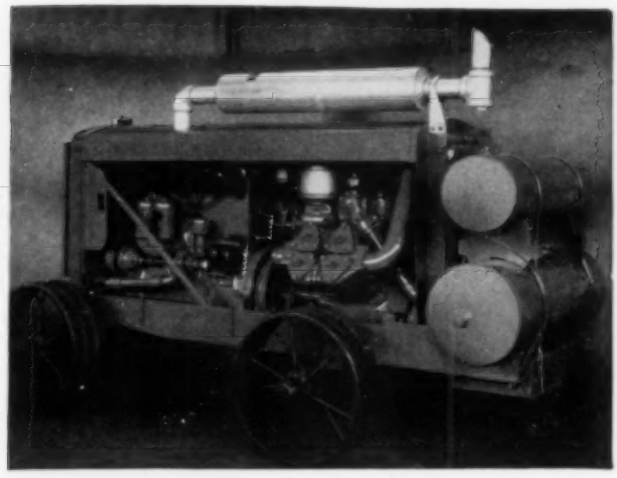
Don't Cost They Pay

Oil the air that drives the tool or cylinder. Smoother operation, less wear, greater protection against rust and corrosion. Automatic. Adjustable. Proved.

Write for catalog 400

C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colorado.

Norgren



MAXIM EQUIPPED FOR GOOD PUBLIC RELATIONS

A portable compressor is apt to spend its service life in many locations where noise is a nuisance to nearby homes and offices. It is good public relations to provide adequate silencing and good practice to choose Maxims for this job. For superior silencing of engine exhaust and intake, compressor intake, steam or air blow-off; for spark arresting or silencing with the heat recovery feature, specify Maxims. Detailed bulletins on request.

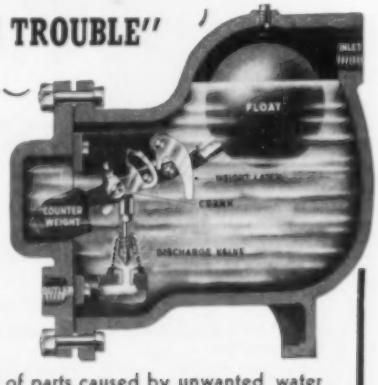
THE MAXIM SILENCER COMPANY
61 HOMESTEAD AVENUE, HARTFORD 1, CONN.

MAXIM SILENCERS

NICHOLSON WEIGHT OPERATED TRAPS

OFFER

A PRACTICAL WAY TO Protect ALL Air Tools and CUT "JAM TROUBLE"

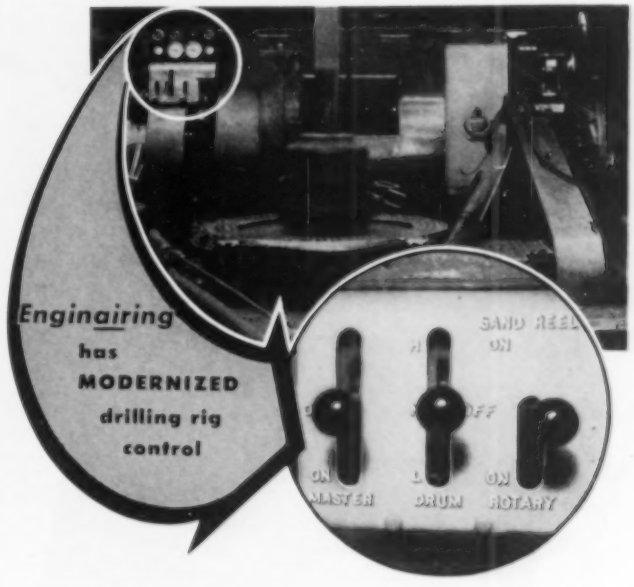


Weight - operated for positive leak-proof action, Nicholson air traps offer service-proved dependable protection against corrosion and jamming of tools, and blemishing of parts caused by unwanted water and oil in air. Four types. Pressures to 1500 lbs. Stainless steel working parts. "The Nicholson" is the trap that is leak-proofed to prevent loss of air.

Catalog 444 or see Sweet's

W. H. NICHOLSON & CO. 180 OREGON ST. WILKES-BARRE PA.

Valves ★ Traps ★ Steam Specialties



NOW — the big engineering developments in drilling rigs have been matched by a big engin*air*ing improvement, that provides completely modern controls.

W-A-B- Controls substitute a few small valves, that can be moved with a finger-touch, for yesterday's levers and pedals. The illustration shows the simplicity and compactness of the master, drum and rotary controls.

Another big advantage is in the engine throttle control. W-A-B- devices permit a group of engines to be accurately and automatically load-balanced when compounded. This assures the most efficient utilization of available power, and eliminates the excessive wear and maintenance that may result when engines do not share the load. A change from compound to individual engine operation can be made in a moment.

Most of the leading manufacturers offer rigs equipped with W-A-B- Controls. For tops in performance, specify W-A-B- apparatus.

PNEUMATIC CONTROLS

WABCO PACKING

WESTINGHOUSE AIR BRAKE COMPANY

Industrial Division - - - Wilmerding, Pa.

When the pressure's on—

USE LE-HI HOSE COUPLINGS

Modern construction is tough on hose couplings. Heavier equipment, higher pressures, stepped-up speeds demand couplings that can really "take it"!

LE-HI Heavy Duty High Pressure Hose Couplings are engineered for those severe service conditions.

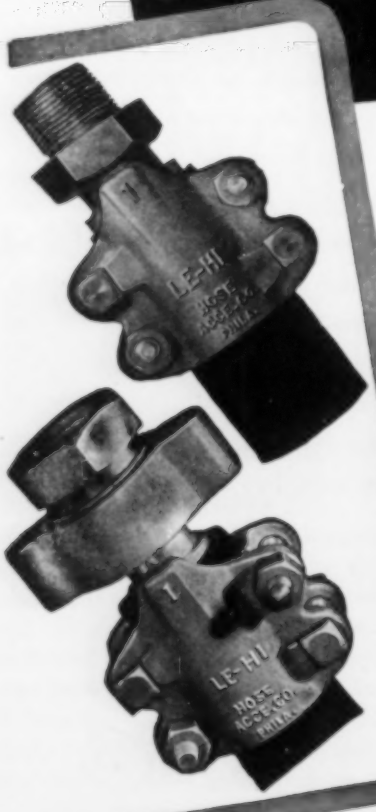
They're SAFE — advanced design prevents them from blowing off, so dangerous to men and to equipment

They're EFFICIENT — parts are made to exacting standards for interchangeability with each other and with other makes and for easy coupling and uncoupling

They're ECONOMICAL — no costly leaks, no need for frequent replacements; correct design means longer life for expensive hose

They're ALL-PURPOSE — equally useful for any high-pressure service: air, gases, steam, water, or other liquids

LE-HI Heavy Duty High Pressure Hose Couplings include Series 400 Female Couplings (in both ground-joint and washer types) and Series 500 Male Couplings.



LE-HI Series 500 Male Coupling with I.P.T. Stem. Sizes ¾" and smaller furnished with two-bolt clamp; 1" and larger with four-bolt clamp.

LE-HI Series 400-G or W Female Coupling with I.P.T. Spud. Sizes ¾" and smaller furnished with two-bolt clamp; 1" and larger with four-bolt clamp.

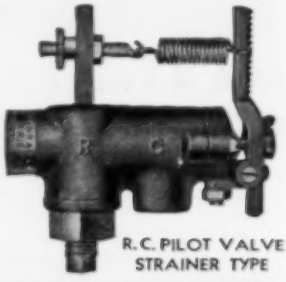
LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS

SOLD ONLY THROUGH LEADING DISTRIBUTORS AND RUBBER MANUFACTURERS

HOSE ACCESSORIES COMPANY
2716 NORTH 17TH STREET • PHILADELPHIA 32, PA.

R. C. PILOT VALVES FOR POSITIVE CONTROL

R-C Unloader Pilot Valves (plain or strainer type) are standard on many leading compressors...installed as replacements on thousands of compressors in all parts of the U.S.A. and overseas. The R-C valve—positive in action—cannot chatter...it's always in open or closed position. Adjustment is provided for any unload-to-load range from 3% to 30% of maximum receiver pressure. Install an R-C Unloader Pilot valve—let performance prove its value. Specify air pressure and range of on-and-off operation desired. Write for price and recommendation.



R.C. PILOT VALVE STRAINER TYPE

R. CONRADER CO.
1207 FRENCH STREET - ERIE, PA.
PILOT VALVES for Portable and Stationary Air Compressors provided with Unloaders

---

BUY ALL THREE FOR ONLY $6.00

or

Any COMBINATION at PROPORTIONATE SAVINGS

COMPRESSED AIR MAGAZINE, 942 Morris Street, Phillipsburg, New Jersey.
Please send me:

- ☐ Compressed Air Data, Cameron Hydraulic Data and Cameron Pump Operators' Data.....All three for $6.00.
- ☐ Compressed Air Data and Cameron Hydraulic Data..Both books for $5.00.
- ☐ Cameron Hydraulic Data and Cameron Pump Operators' Data Both books for $4.50.
- ☐ Compressed Air Data and Cameron Pump Operators' Data Both books for $4.50.
- ☐ Enclosed is (money order) (check) for $.....) ☐ Send books C.O.D. I understand that the books will be sent me postpaid, and that they may be returned within 10 days if not satisfactory.

Name .....
Company .....
Street No. .....
City .....State .....Country .....

"MINE KING" AIR HOSE

Built to Stand Rough Service LONGER!

AVAILABLE IN LONG LENGTHS

A Goodall "Standard of Quality" product . . . your assurance of safe, reliable service under conditions that would spell early failure for hose made to less exacting specifications.

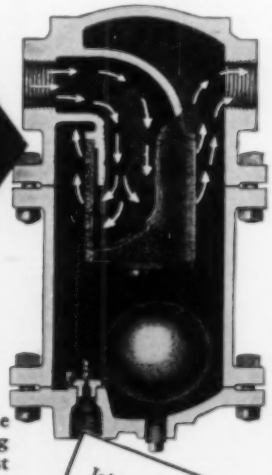
"Mine King" is made with a long-wearing, oil-resistant tube; a husky duck carcass; and a tough, resilient cover that withstands excessive abrasive wear and acts as a shock absorber against falling rock, timbers, tools, etc. *Contact our nearest branch for complete details.*

GOODALL RUBBER CO., INC.

THE GOODALL-WHITEHEAD COMPANIES

Philadelphia • Trenton • New York • Boston • Pittsburgh • Chicago • St. Paul • Los Angeles
San Francisco • Seattle • Salt Lake City • Houston • Factory: Trenton, N. J. • Est. 1870

NO MOISTURE OR DIRT GETS BY HERE



Johnson Self-Draining Compressed Air Separator.....

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. **Controlled expansion of air in separator precipitates most of the moisture.**
2. **A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.**

Johnson Separation Devices include Separators for Compressed Air or Steam, After coolers, oil absorbers.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

WRITE FOR CATALOG

The Johnson Corporation

830 WOOD STREET — THREE RIVERS, MICH.

For PERMANENTLY Tight Joints

Particularly Effective on joints subject to Vibration, Expansion or Contraction

GARLOCK Pipe Thread Compound is a superior material developed in the Garlock laboratories for application to threaded joints of pipe lines and other equipment handling steam, water, gas, air, hot or cold oil, gasoline, kerosene or alcohol.

You can depend on GARLOCK Pipe Thread Compound to make a permanently tight joint even under difficult conditions, as it will not harden, shrink or corrode. In fact, it protects joints from corrosion, rust and "freezing."

GARLOCK Pipe Thread Compound, ready to apply as it comes from the can, is handy to use and is economical—only a thin coating is required to make a joint. Does not spoil or deteriorate if kept in stock for long periods of time. Available in 2-lb., 4-lb. tin cans and in larger containers.

THE GARLOCK PACKING COMPANY
PALMYRA, N. Y.

In Canada: The Garlock Packing Company of Canada Limited, Montreal, Que.

Does Not Harden or Shrink

Keeps Joint from "Freezing"

Protects Against Rust and Corrosion

Does Not Drip

Does Not Spoil or Deteriorate

Garlock PIPE THREAD COMPOUND

We actually mean water, for when hot summer days come along, the problem of securing large quantities of chilled water is a serious one in many industries . . . Especially if river or pond water is the main source of supply.

If you've been having trouble with your cooling water supply—if its not cold enough or if you need more of it—then you should investigate Ingersoll-Rand Water-Vapor Refrigeration.

HERE ARE A FEW IMPORTANT FEATURES:

20 to 1200 tons of refrigeration in a single unit.

Chilled water temperatures of approx. 45°F.

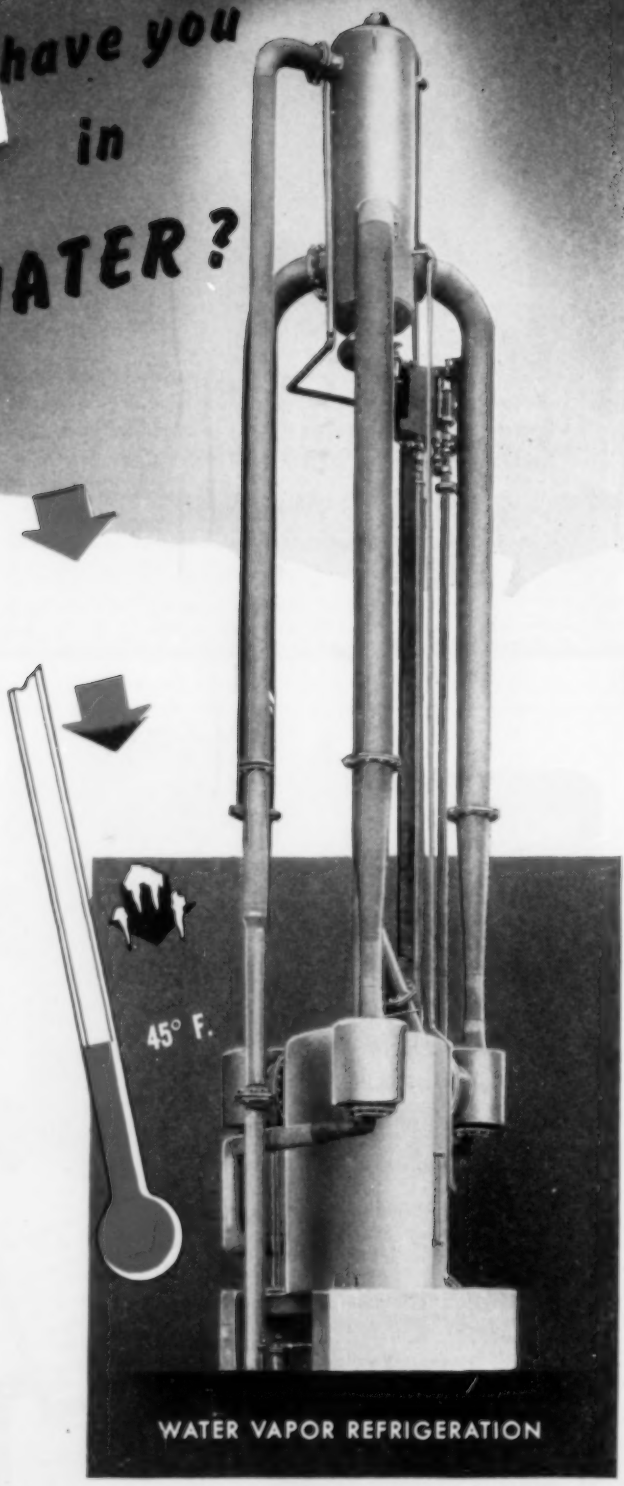
Water is the only refrigerant . . . there are no expensive, dangerous or toxic refrigerants to worry about.

There are no moving parts in the cooler itself. Cooling is obtained by direct evaporation of water in a high vacuum.

Units are entirely self supporting and can be installed out doors.

HERE'S HOW TO GET MORE INFORMATION:

First, ask the nearest Ingersoll-Rand Branch Office for a copy of bulletin No. 9143-A. If you would prefer to discuss your problem in detail, one of our engineers will be glad to call on you.



AIR TOOLS
COMPRESSORS
CONDENSERS
ROCK DRILLS
TURBO BLOWERS
CENTRIFUGAL PUMPS
OIL & GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 28-13

FROM THE RECORD

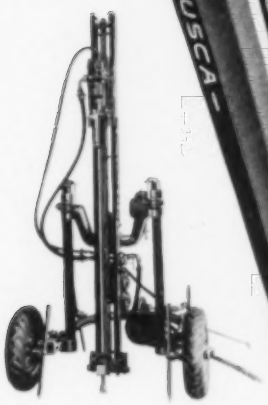
CRUCIBLE'S CRUSCA DRILL STEEL

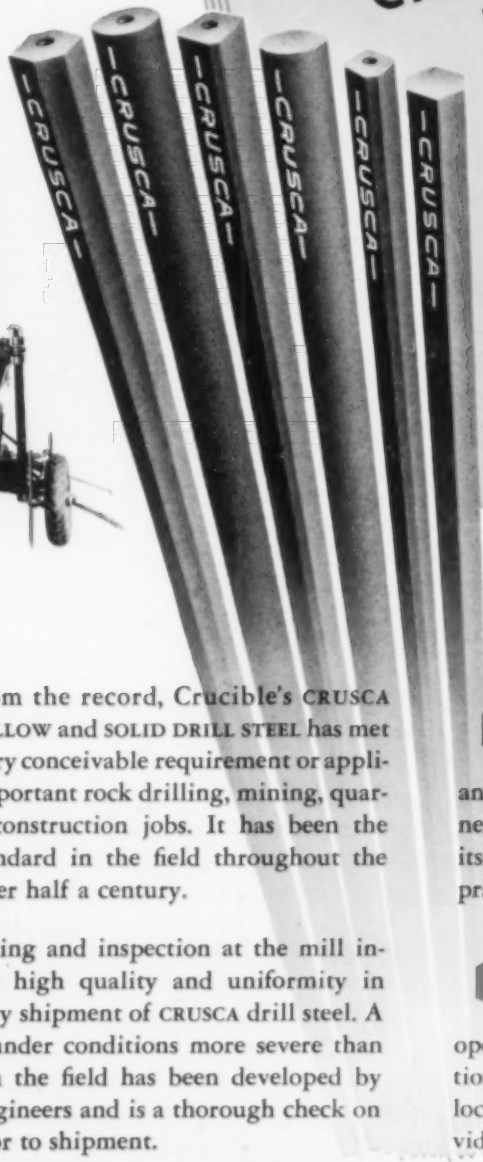
A few outstanding CRUSCA jobs

- CASCADE TUNNEL
- BOULDER DAM
- T.V.A.
- GRAND COULEE
- DELAWARE AQUEDUCT
- PENNSYLVANIA TURNPIKE
- BROOKLYN-BATTERY TUNNEL

THREE SHAPES

ALL SIZES





From the record, Crucible's CRUSCA HOLLOW and SOLID DRILL STEEL has met every conceivable requirement or application on important rock drilling, mining, quarrying, and construction jobs. It has been the accepted standard in the field throughout the world for over half a century.

Testing and inspection at the mill insure high quality and uniformity in every shipment of CRUSCA drill steel. A fatigue test under conditions more severe than any found in the field has been developed by Crucible's engineers and is a thorough check on every lot prior to shipment.

The low cost of CRUSCA per foot of hole is the result of excellent shank qualities, resistance to fatigue, uniformity of analysis and structure, hole concentricity, stiffness and accuracy of section. Blacksmiths praise its heating and forging characteristics. Drillers praise the way it makes hole fast.

CRUSCA drill steel is available in both carbon and alloy types . . . in three shapes . . . and in all sizes. Newly developed alloy steels are available for jack stud insertion. Whatever your drill steel problems, your local, experienced Crucible salesman can provide a CRUSCA drill steel to meet your needs.

Write for latest CRUSCA catalog.

CRUCIBLE STEEL Company of America

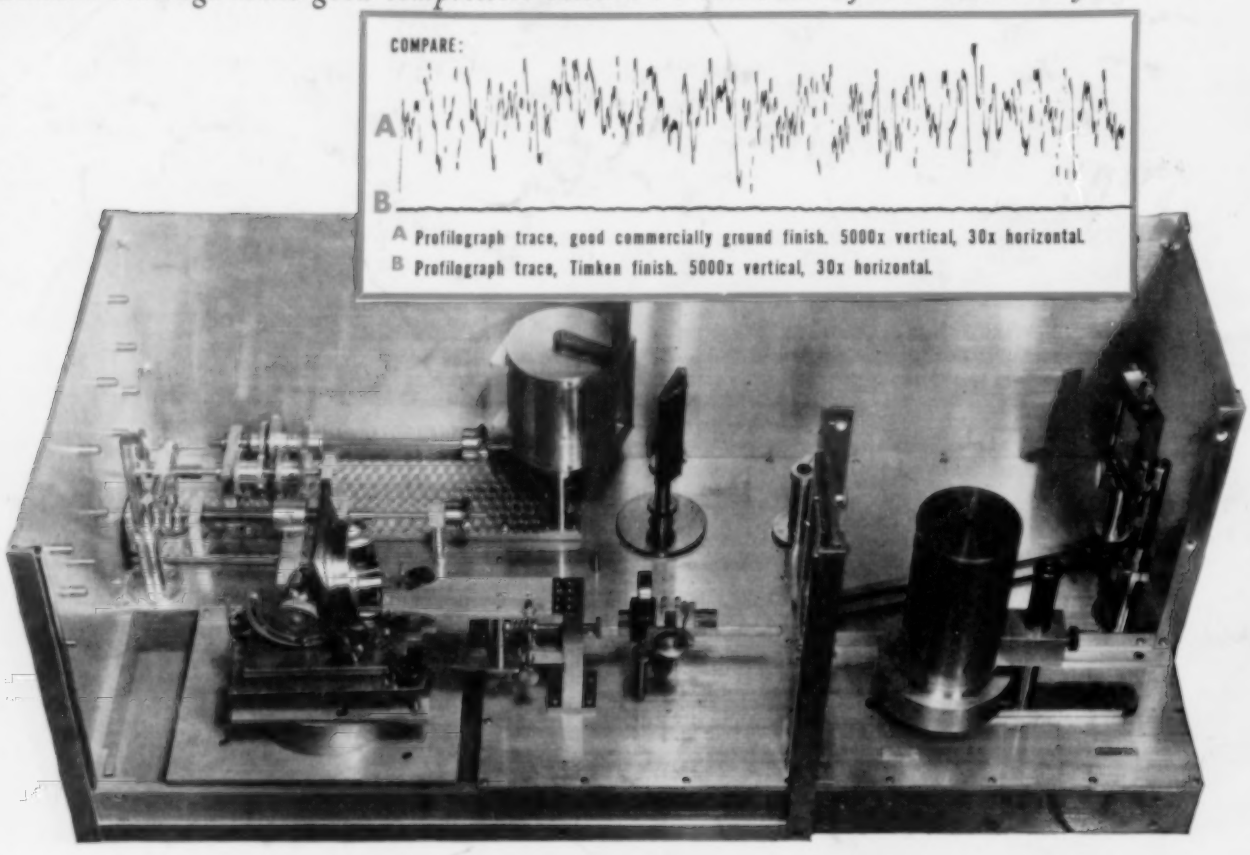
"FULL-RANGE" QUALITY STEELS for INDUSTRY

HIGH SPEED · TOOL · STAINLESS · ALLOY · MACHINERY · SPECIAL PURPOSE STEELS

Chrysler Building, 405 Lexington Ave., N. Y. 17, N. Y.

Branches, Warehouses, and Distributors in Principal Cities. Consult your Telephone Directory or Thomas' Register for Nearest Office

Timken bearings make good compressors better . . . here's one of the reasons why:


COMPARE:
A
B
A Profilograph trace, good commercially ground finish. 5000x vertical, 30x horizontal.
B Profilograph trace, Timken finish. 5000x vertical, 30x horizontal.

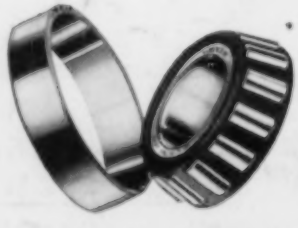
Answers the question— "How rough is smooth?"

ONE of the reasons Timken tapered roller bearings perform with such frictionless, wear-free ease is the amazingly smooth surface finish on the rolls and races —the finest known to modern bearing science.

Now, when you talk about finishes like this, you're talking about surface irregularities of only a few millionths of an inch—irregularities which are impossible to detect by any ordinary means. So, when Timken first began to develop this finish, one of the biggest obstacles was the absence of an accurate method of measuring the roughness of an apparently smooth surface.

The profilograph pictured above was the answer. Developed by Timken in 1928 and steadily improved since then, the profilograph determines surface irregularities to within one-millionth of an inch. Equipped with this measuring stick, Timken engineers were able to develop new finishing methods and machines, which have resulted in the microscopic surface accuracy of the Timken bearings you use today.

Every factor in the efficiency of a bearing is approached at Timken in this same scientific manner. For example, Timken makes its own steel to assure constant quality. And Timken is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. No wonder you can always be sure of uniformly top quality and performance in the Timken bearings you use. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION ✳